HOUSATONIC RIVER FLOOD CONTROL

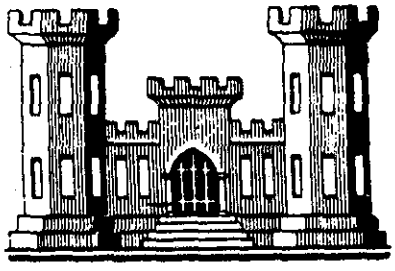
DANBURY, CONN.

LOCAL PROTECTION

STILL RIVER, CONNECTICUT

DESIGN MEMORANDUM NO. 4

EMBANKMENTS, FOUNDATIONS AND CHANNEL IMPROVEMENTS



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

APRIL 1969

14

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

IN REPLY REFER TO:

NEDED-E 30 April 1969

SUBJECT: Danbury Local Protection Project, Still River Housatonic River Basin, Connecticut, Design Memorandum No. 4, Embankments, Foundations and Channel Improvements

Chief of Engineers
ATTN: ENGCW-E

There is submitted herewith, for review and approval, Design Memorandum No. 4, "Embankments, Foundations and Channel Improvements," for the Danbury, Connecticut, Local Protection Project, Still River, Housatonic River Basin, in accordance with ER 1110-2-1150.

FOR THE DIVISION ENGINEER:

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as

JOHN Wm. LESLIE
Chief, Engineering Division

DANBURY LOCAL PROTECTION PROJECT

STILL RIVER

HOUSATONIC RIVER BASIN

CONNECTICUT

DESIGN MEMORANDUM NO. 4

EMBANKMENTS, FOUNDATIONS AND CHANNEL IMPROVEMENTS

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DESIGN MEMORANDUM NO.4

EMBANKMENTS, FOUNDATIONS AND CHANNEL IMPROVEMENTS

A. INTRODUCTION

1. Purpose and Scope. The purpose of this memorandum is to present the analyses and results of subsurface investigations and soil engineering studies undertaken for the design of the Danbury Local Protection Project. The subsurface investigations included geological studies, subsurface explorations, and laboratory soil tests. These studies were made to determine the distribution and characteristics of foundation soils, embankment materials, fills and backfills; and to determine soil conditions relevant to excavations, side slopes, embankments and foundations. Soils engineering studies were made to develop safe and economical earthwork and foundation design and construction methods.

2. Location and Description of Project. The Danbury Local Protection Project is located along the Still River in the City of Danbury, Connecticut, about 55 miles southwest of Hartford, Connecticut and 65 miles northeast of New York City. The recommended project consists of about 6320 feet of channel improvement, rectification and cutoff, all between and connecting the Central Flood Control and Urban Renewal improved channel at the upstream end and the State of Connecticut Flood Control improved channel at the downstream end. The recommended plan includes a rectangular-shaped reinforced concrete channel 3625 feet long and a stone revetted channel 2695 feet long. Low earth dikes will be required along approximately one-half of the alignment of the revetted channel.

3. Geological Studies. The details of the geological studies are presented in approved Design Memorandum No. 2, "General Design and Site Geology."

B. SUBSURFACE INVESTIGATIONS

4. General. Subsurface investigations were made in conformance with current criteria and practices as described in Corps of Engineers Manual EM 1110-2-1803, "Subsurface Investigations - Soils." The subsurface exploration program accomplished to date is considered adequate for the development of plans and specifications.

5. Explorations. All explorations in overburden were drive-sample borings. Continuous disturbed samples were taken by driving a 5-foot solid barrel sampler by the impact of a 300 pound weight falling free a distance of about 18 inches. Boring locations are shown on Plate No. 4-1.

6. Laboratory Tests. All laboratory tests were performed in accordance with standard procedures outlined in Corps of Engineers Manual EM 1110-2-1906, "Laboratory Soils Testing." All soil samples were classified visually in conformance with the Unified Soil Classification System. Grain size and Atterberg Limits tests were made on selected samples to confirm visual classification and to provide more precise data where considered necessary. Natural water contents were determined for selected samples of fine-grained soils.

7. Presentation of Data. A geologic profile and graphic logs of borings are presented in approved Design Memorandum No. 2, "General Design and Site Geology." Summaries of laboratory soil test results and a tabulation of engineering logs (soils reports) are presented in Appendices A and B respectively, to this memorandum.

The engineering logs (soils reports) were prepared for all explorations by the design soils engineer with the aid of laboratory test data and the assistance of an experienced soils classifier. These logs include description of soils and soil stratification based on the engineer's examination of the samples and his interpretation of the test results and the exploration data. The descriptions include the relative compaction or consistency of a soil, estimated or measured percentages of soil grain size components, soil classification, color, effective grain sizes, Atterberg Limits, details regarding stratification, presence of foreign matter, natural water content, and other information considered significant to aid in judging the engineering properties of the soil.

C. CHARACTERISTICS, DESCRIPTION, AND DISTRIBUTION OF OVERBURDEN MATERIALS

8. General. Approximately 80 percent of the project alignment is located along the present course of the Still River. The remaining portion is located away from the river from about Station 47+00 to 59+00, and in this reach a new river channel will be constructed to divert the river across the lower portion of a moderately high hill and across relatively flat terraces.

The Still River has been channeled into its present location by land filling through urban activities and by recent flood depositions. The riverbanks contain man-made fills and recent flood deposition. The soils below riverbed elevation consist of a heterogeneous deposition of glacial lake sediments, coarse-grained glacial outwash and recent alluvium. Between Stations 47+00 and 59+00, the overburden consists of terrace deposits composed essentially of coarse-grained soils.

A generalized soil profile along the project channel centerline and the location of all borings are shown on Plates 2 thru 6. Appendix A contains laboratory soil test data, and Appendix B contains engineering descriptions of soil samples. The gradation ranges of the various soil types and selected typical grain size curves are shown on Plates 7 thru 11. Geologic investigation in regards to stratigraphy, ground water, and bedrock is included in approved Design Memorandum No. 2, "General Design and Site Geology."

9. Station 9+20 to 47+00. The riverbanks are 5 to 15 feet high and contain man-made and recent flood-laid deposits. These deposits consist of layers of loose, silty sand, gravelly sand, soft ashes, loose cinders and ashes, silt with organics, and mixtures of all of the above materials with varying amounts of brick, glass and wood. In many areas the entire bank above streambed elevation contains loose cinders and ashes. In general, these deposits do not extend below riverbed elevation, and in some reaches are underlaid by a layer, 1 to 3 feet thick, of sandy silt and silty sand mixed with organic matter.

The characteristics, description, and distribution of the soils below riverbed elevation are discussed in the following subparagraphs.

a. Station 9+20 to 21+00. The overburden below riverbed elevation consists of a top stratum, 5 to 8 feet thick, of moderately compact silty sandy gravel and silty gravelly sand. These gravelly soils contain 25 to 60 percent gravel sizes and less than 12 percent silt sizes. Underlying this top stratum there is a deposit of moderately compact to compact cohesionless silt and sandy silt. Boring FD-16 was drilled 20 feet deeper than the other borings in this reach of the alignment and it showed that underlying the top 15 feet of cohesionless silt, there is slightly cohesive clayey silt having a PI of about 6.

The borings upstream of Station 15+00 did not extend through the silt stratum; however, a boring made by others approximately 150 feet upstream of the limit of this project indicated that the silt stratum extends to a depth of about 50 feet below the riverbed.

Downstream of Station 15+00, the silt stratum thins out to about a 5-foot thickness and it is underlaid by moderately compact to compact silty sandy gravel and gravelly silty sand. Bedrock was encountered in Boring FD-20, (left bank, Station 19+20) at about 25 feet below riverbed elevation. In general, the soils underlying the silt stratum contain 10 to 45 percent silt sizes.

Gradation ranges are shown on Plate 7.

b. Station 21+00 to 29+00. Below riverbed elevation, the soils consist of loose to moderately compact, to compact, silty gravelly sand and silty sandy gravel. Between about Stations 22+00 and 24+00, and between 25+00 and 29+00, these gravelly soils overlie loose sandy silt at a depth of about 10 to 15 feet below riverbed elevation. The gravelly soils contain 25 to 70 percent gravel sizes. The upper 10 to 15 feet of gravelly soils contain less than 15 percent silt sizes, and between Stations 24+00 and 27+00 contain minor amounts of cinders and coal. Below this depth these soils contain a higher silt percentage. Typical grain size curves are shown on Plate 8.

c. Station 29+00 to 31+00. The overburden below riverbed elevation is relatively thin and it consists of moderately compact silty gravelly sand, sandy silt, and silty sandy gravel with cobbles. Bedrock was encountered in borings FD-24 and FD-27, at depths of 10 and 15 feet below riverbed elevation, respectively. The gravelly soils contain, in general, 40 to 60 percent gravel sizes and less than 20 percent silt sizes. Typical grain size curves are shown on Plate 8.

d. Station 31+00 to 47+00. Below riverbed elevation upstream of Station 41+00, there is an upper deposition of coarse-grained soils, 3 to 18 feet thick, consisting of stratified layers of loose to moderately compact silty sand, silty sandy gravel, and silty gravelly sand, all containing less than 15 percent silt sizes. Underlying these upper soil strata, there is a deposit which contains layers of moderately compact sandy silt, silty sand laminated with thin varves of clayey silt, and thinly stratified sandy silt and clayey silt.

Downstream of Station 41+00 the coarse-grained soils overlie rock at depths of about 5 to 25 feet below riverbed elevation. These soils are moderately compact silty sand, silty sandy gravel, and silty gravelly sand containing less than 10 percent silt in the upper few feet near riverbed elevation and generally higher silt percentage below.

Gradation ranges are shown on Plate 9.

10. Station 47+00 to 59+00. Along this reach of the alignment, the proposed channel is to be excavated across a moderately high hill from about Station 47+00 to 50+00, and across relatively flat terraces from Station 50+00 to about 59+00. The overburden within the maximum explored depth consists of loose to moderately compact coarse-grained soils. Along the right side of the channel near Station 48+00, rock was encountered at 35 feet below ground surface. The gradation range of overburden materials is shown on Plate 10. The characteristics, description, and distribution of the various soils are discussed in the following subparagraphs.

a. Station 47+00 to 50+00. The overburden materials to depths of over 40 feet contain zones of moderately compact silty gravelly sand and silty medium to fine sand. The zones of silty gravelly sand contain layers of medium to fine sand and silty sandy gravel. Near Station 48+00, at the right side of the proposed channel (see log of boring FD-1), rock is about 35 feet below ground surface. The silty medium to fine sand contains generally 10 to 30 percent silt sizes. The silty gravelly sand contains generally 5 to 15 percent silt sizes.

b. Station 50+00 to 53+00. The overburden in this reach within the maximum explored depth of 35 feet consists essentially of loose to moderately compact silty fine and medium to fine sand. Boring FD-25 (vicinity of Station 52+00) disclosed that below a 25 foot depth, the silty sand is stratified with sandy silt. The silty sand in the upper 15 feet contains generally between 10 and 25 percent silt sizes and below this depth the percentage ranges from 20 to 50 percent.

c. Station 53+00 to 59+00. The overburden consists of stratified layers of loose to moderately compact silty sand, medium to fine sand, gravelly sand, silty gravelly sand and silty sandy gravel. The gravelly soils contain generally less than 15 percent silt sizes. The medium to fine sand contain silt sizes ranging from 3 to 40 percent.

11. Station 59+00 to 72+00. Within this reach the project consists of channel improvement and rectification. Riverbanks are generally 5 to 10 feet high.

a. Station 59+00 to 66+00. The overburden above riverbed elevation consists of 0 to 6 feet of man-made fills overlying 2 to 3 feet of recent flood laid deposits. The man-made fills consist generally of loose, silty, gravelly sand containing 5 to 15 percent silt and 20 to 40 percent gravel. The flood laid deposits consist of loose, silty, fine and medium to fine sands and soft organic silt. These sands contain 20 to 50 percent silt with roots and other organics.

Below riverbed elevation, the soil consists of 4 feet of silty sandy gravel overlying silty fine, to medium to fine sands. The gravel contains less than 10 percent silt and from 35 to 45 percent sand. The underlying sands contain less than 15 percent silt sizes upstream of Station 62+00 and more than 30 percent downstream. Gradation ranges are shown on Plate 11.

b. Station 66+00 to 72+00. The overburden in the area of the existing river bed consists of 3 to 9 feet of gravelly soil overlying moderately compact sandy silt and silty sand. The gravelly soil is in two layers. The top layer, 0 to 5 feet thick, is a recent flood plain deposit and consists of moderately compact, silty gravelly sand with roots and other organics and contains 25 to 35 percent silt and 10 to 20 percent gravel. The second layer consists of 3 to 4 feet of moderately compact sandy gravel with less than 10 percent silt and from 35 to 45 percent sand. The underlying sandy silt contains 40 to 50 percent sand sizes and the silty fine sand contains 15 to 25 percent silt. Gradation ranges are shown on Plate 11.

D. DESCRIPTION, CHARACTERISTICS AND AVAILABILITY OF EARTH, GRAVEL AND ROCK MATERIALS.

12. General. The design of the various earthwork features has been made on the premise of maximum utilization of materials from required excavation. Earth and channel fill materials will be obtained from

required excavation. Processed gravel, processed sand, gravel and stone will be supplied by the contractor. A material usage chart is shown on Plate 13.

13. Materials from Required Excavations.

a. Earth Fill Material. Earth fill material is required for the construction of dike embankments, for filling of abandoned portions of the river channel and for backfilling the areas behind the side walls of the concrete channel. Silty sandy gravel, silty gravelly sand, and silty sand from required excavations are considered suitable earth fill material. These soils are available with a minimum amount of selection from required excavation between Station 47+00 and 59+00; however, to insure that significant quantities of highly silty soils are not included in the earth fill material, the specifications will limit to 40 percent maximum, the amount of particles which can pass a 200 mesh sieve. The gradation range of materials from Station 47+00 to 59+00 is shown on Plate 10.

b. Channel Fill Material. Channel fill material is required for filling the portions of the existing channel which are to be abandoned and for filling certain areas adjacent to the project channel. Channel fill material will consist of any material from required excavations which can be spread in a 12-inch layer. Materials from required excavations between Station 47+00 and 59+00 will not be allowed to be used in channel fill until all quantity requirements for earth fill material are satisfied.

14. Materials Furnished by the Contractor.

a. General. Processed sand, processed gravel and gravel fill materials will be used in the construction of the drainage system of the U-frame concrete channel. Stone protection, crushed stone and gravel bedding will be used in revetting permanent excavation cuts and channel side slopes of dikes. All of the above materials are available from commercial sources within about 25 miles of the project site.

b. Processed Gravel. Processed gravel material shall meet the quality and gradation requirements for "3/4 inch to No. 4" coarse aggregate for portland cement concrete.

c. Processed Sand. Processed sand material shall meet the quality and gradation requirements for fine aggregate for portland cement concrete. (No. 4 to No. 100 mesh)

d. Gravel Fill and Gravel Bedding. Gravel fill and gravel bedding materials shall consist of processed materials or of bank-run sandy gravel or gravelly sand, of suitable quality and meeting the following gradation range:

U. S. Standard Sieve	Percent Passing by Weight	
	Gravel Fill	Gravel Bedding
8-inch	100	100
3-inch	70-100	70-100
1-inch	50-95	50-85
No. 4	30-65	30-65
No. 40	10-30	10-30
No. 200	0-8	0-12

The above gradation ranges were made as wide as possible to permit usage of available bank-run materials. The slight variation in gradation requirements between these two materials is needed to meet design requirements for filter criteria and relative permeability.

e. Stone Protection. Stone protection material shall consist of processed quarried rock or crushed rock weighing at least 162 pounds per cubic foot and graded within the following range:

Stone Weight	Percent by Weight Finer
90 lbs.	100
Between 15 & 25 lbs.	50
Less than 10 lbs.	15
Less than 2 lbs.	0

f. Crushed Stone Material. Crushed stone material to be used for revetting the permanent cut slopes above the stone slope protection will consist of crushed rock or crushed gravel meeting the quality and gradation requirements for "1-1/2-inch to 3/4-inch" coarse aggregate for portland cement concrete.

E. DESIGN OF DIKE AND REVETTED CHANNEL

15. General. The revetted channel is approximately 2700 feet long and 75 feet wide at the bottom. The side slopes are 1 on 2.5 below the top of the stone protection and 1 on 2 in excavations above that elevation. Low earth dikes will be required on both channel banks along one-half of the alignment. The channel depth is about 15 feet and it includes a 3-foot freeboard except downstream of about Station 66+00, where the banks are below the elevation of the Standard Project Flood and overbank flooding may occur. The average velocity for the design discharge of 6,900 cfs varies from 5 to 7 feet per second. The channel bottom will be V-shaped to provide confinement of low flows. The center of the V-shape will be a maximum of 3 feet lower than the outside edges. A typical section of dike and channel is shown on Plate 12.

16. Design Criteria. Channel side slopes and landside dike slopes were designed to produce stable and economical structures in accordance with pertinent sections of Engineering Manual EM 1110-2-2300, "Earth Embankments" and other manuals and publications referred to therein, and also in accordance with pertinent Engineer Technical Letters. The requirements for slope revetment within the lower 15 feet of the channel were determined using the criteria based on the "tractive force" theory described in the draft report entitled: "Criteria for Graded Stone Riprap Channel Protection", dated 20 April 1966, and the revetment design is included in approved Design Memorandum No. 1, "Hydrology and Hydraulic Analyses."

17. Dike Foundation Conditions and Treatment.

a. General. Description, distribution and characteristics of overburden materials are discussed in Section C above. In general, these materials are cohesionless coarse grained soils; based on experience with similar materials, it is estimated that the angle of internal friction, case of effective stresses, varies from 25 to 35 degrees. The effective coefficient permeability of the foundation varies considerably because of the heterogeneous nature of the overburden; the soils contain percentages of silt varying from less than 7 percent to over 40 percent by weight; the relative densities vary from loose to compact; the soils are stratified, bedded and cross-bedded. It is estimated that the more pervious soils have effective coefficients of permeability in the range of .01 to .001 cms per sec., and the less pervious soils about .0001 cms per sec. The ratio of horizontal to vertical permeability is estimated to be generally not over 16. The differential water head under Standard Project Flood

Condition is less than 4 feet, and foundation seepage studies have been confined to general evaluation based on engineering judgment. In conclusion, it is considered that the foundation soils have ample shear strength to support the dike embankments and that because of the low water heads and relatively wide dike embankments that foundation seepage will be under a small gradient.

b. Station 45+20 to 48+50. Along the left bank of the project channel, the dike foundation surface is generally at or above the elevation of the Standard Project Flood. The upper 6 feet of foundation contain layers of loose sandy silt, silty gravelly sand and some organic silt. The underlying soils consist of moderately compact silty sandy gravel and silty gravelly sand.

Along the right bank the dike foundation surface is generally within 3 feet of the elevation of the Standard Project Flood. The upper 7 feet of the foundation consist of layers or zones of man-made and recent floodlaid fills which contain coal, wood chips, peat, all mixed with varying amounts of silty sand. In some zones the volume of silty sand alone is about one-third of the total volume. Underlying these fills there are layers of loose to moderately compact sandy gravel, silty sand, and silty gravelly sand.

Foundation treatment for the left bank dike will consist of removal of topsoil and soft organic soil. The present river channel will be filled with compacted earth fill material within the dike foundation area and with channel fill material landside of the dike. The finish grade of channel fill will be at the elevation of the Standard Project Flood water surface.

Foundation treatment along the right bank will consist of removal of the man-made and flood plain fills from the area within 12 feet of the cut slope of the channel and replacement with compacted earth fill. This treatment will insure a stable channel slope. The area landside of the dike will be filled with channel fill material to the elevation of the top of protection.

c. Station 54+00 to Sta. 66+20. The ground surface along dike foundation areas is at or above the elevation of the Standard Project Flood water surface upstream of Sta. 60+50, and within 2 feet of that elevation downstream of Station 60+50. Foundation materials consist generally of bedded zones of loose and moderately compact gravelly sand, sandy gravel and sand, all containing varying amounts of silt.

Foundation treatment will consist of stripping of topsoil from within the dike foundation area and filling of the present river channel. The river channel will be filled with compacted earth fill material within the foundation area of the dike embankments, and with channel fill material landside of the dike. The finish grade of channel fill will be within 1.5 feet of the elevation of the Standard Project Flood water surface.

18. Dike Embankment. The tops of the embankments will not be higher than 7 feet above the landside ground and not higher than 15 feet above the channel bottom. The differential head of water under Standard Flood water surface condition will be 4 feet and under.

The dike will have a homogeneous embankment section. The embankment will be constructed with compacted earth fill material from required excavation. The description and characteristics of earth fill material are discussed in Section D above.

The dike crest was made 20 feet wide to provide ample seepage path, and to provide working space for compaction equipment on the earth fill section. For the case of the maximum differential head of 4 feet, the base width of the embankment is more than 50 feet. The top and the landside slope will be grassed to provide protection against erosion by runoff and wind. The channel side slope will be revetted with stone protection placed on gravel bedding. The landside slope of 1 on 2 is considered stable and adequate for operation of power mowing and refertilizing equipment considering that the landside embankment heights are under 7 feet. The channel side slope of 1 on 2.5 was selected to provide a stable slope under the rapid drawdown condition, and other conditions.

19. Channel Cut Slopes. Cut slopes required for the construction of the revetted channel are 25 to 45 feet high from Station 47+00 to 50+00, 20 to 35 feet from Station 50+00 to 54+00, and less than 15 feet everywhere else. The river flow will be contained in the lower 15 feet of the cut.

The excavations will be generally in earth although rock excavation is expected in the lower parts of the cut in the vicinity of Station 48+00. The description, distribution and characteristics of overburden materials are included in Section C above. Bedrock is discussed in approved Design Memorandum No. 2 "General Design and Site Geology." The overburden materials are generally cohesionless, coarse grained soils; based on experience with similar materials, it is estimated that the angle of internal friction, case of effective stresses varies from 25 to 35 degrees.

The lower 10 feet of excavation will be below the surface of ground water and control of ground water seepage into the channel is considered essential. Below the top of the stone protection, the finish channel slope will be 1 on 2.5; exit seepage will be controlled by a zone of gravel bedding material about 2 feet wide at the top and 8 feet wide at the bottom. Channel slopes and bottom will be revetted with stone protection. The gravel bedding material, which will be placed also on the channel bottom, has been designed to provide filter action between the underlying soil and the overlying stone protection. The design gradation range for the gravel bedding is shown in Section D above.

Above the top of the stone protection, the cut slopes will be 1 vertical on 2 horizontal. These upper slopes are well above the ground water. The slopes will be protected by a 12-inch layer of crushed stone and/or crushed gravel against erosion by run-off and wind. The crushed stone and/or crushed gravel will also adequately control exit seepage from rainfall and frost melt. The gradation range of the crushed stone and crushed gravel is shown in Section D above.

20. Stone Protection. The design of stone protection was based on the "tractive force" theory. Approved Design Memorandum No. 1, "Hydrology and Hydraulic Analyses", presents design criteria, required stone sizes, D_{50} sizes, and layer thicknesses. In response to review comments from Office, Chief of Engineers, the stone sizes and layer thickness in a certain reach of the project were revised. The required range of stone sizes is shown in Section D of this memorandum. The required layer thickness is 12 inches except that within 50 feet downstream of the concrete channel stilling basin, the layer thickness on the channel bottom will be 24 inches.

E. CONCRETE CHANNEL

21. General. The proposed concrete channel is a reinforced concrete U-frame structure having a usable channel section 40 feet wide and 13 feet deep including a minimum 2.3 feet of freeboard. This section does not include structural design procedures which are within the scope of Design Memorandum No. 5, "Structures." A typical concrete channel section is shown on Plate 12.

22. Excavation. The bottom of the excavation required for the construction of the concrete channel and its uplift pressure relief system will be about 10 feet below the surface of the riverbed and 15 to 25 feet below the top of riverbanks. The excavation width will be made ample enough to provide space for construction drainage ditches. The descriptions, characteristics and distribution of overburden materials are discussed in Section C above. Bedrock is discussed in

approved Design Memorandum No. 2, "General Design and Site Geology." General description of the soils at the bottom and sides of the excavation are discussed in the subparagraphs that follow.

a. Bottom of Excavation. From Sta. 9+20 (start of concrete channel) to about Station 15+00, the bottom of the excavation will be in moderately compact silt. Downstream of Station 15+00, the bottom will be in moderately compact and compact sandy silt in limited reaches between Stations 15+00 and 22+00, and between Stations 34+00 and 38+00. The bottom will be in rock in the vicinity of Station 30+00. Elsewhere, the bottom of the excavation will be in loose and moderately compact silty gravelly sand, silty sandy gravel and silty sand.

b. Sides of Excavation. The sides of excavations above riverbed elevation will be in riverbanks, 5 to 15 feet high, containing materials which have been deposited either by recent floods or by urban activities. The man-made fill is composed mainly of cinders and ashes, and the recent flood-laid deposit contains layers of loose silty sand, silty gravelly sand, and sandy gravel. At the base of the riverbanks at about elevation of the riverbed, there is in most areas a layer 1 to 3 feet thick of soft silt which contains organic matter.

The lower 10 feet of the sides of excavation will be below the elevation of the riverbed. In these lower reaches, except in the rock areas and in the silt areas described below, the sides of the excavation will be in coarse grained soil consisting mainly of moderately compact silty sandy gravel and silty gravelly sand with occasional zones of silty sand. Upstream of Station 15+00, the lower 5 to 7 feet of the excavation will be in moderately compact silt. In certain reaches between Station 15+00 and 40+00 the lower 1 to 3 feet of the excavation will be in sandy silt; these silt occurances are most probable between Stations 15+00 and 22+00 and between 34+00 and 38+00.

23. Foundation Base Pressures and Settlement. Design Memorandum No. 5 "Structures", includes design procedures. The total downward force of the structure is resisted by uplift forces, side frictional forces, and effective foundation base pressures. Preliminary computation indicate that the effective foundation base pressures are well within the allowable bearing capacity of the soil.

The design procedures follow various assumptions regarding the distribution of base pressures. For the method of analysis by the theory of elastic beams on a continuous elastic support, the numerical value of the coefficient of subgrade reaction was estimated on the

basis of published data. It is estimated that the coefficient of subgrade reaction (1 sq. ft. plate) varies from a minimum of about 50 tons per cubic foot on loose to moderately compact silt foundations to a maximum of about 150 tons per cubic foot on the moderately compact gravelly sand and sandy gravel.

Considering the magnitude of foundation loads, and the characteristics of the foundation soils, it is estimated that settlement due to consolidation of the soil will be insignificant.

24. Uplift Pressures and Drainage System. The magnitude of the uplift pressures depends on the elevation of the ground water outside the channel and the elevation of the river inside the channel. The U-frame channel structure will be a partially relieved structure. The structural design for the low river level condition depends on a drainage system to prevent uplift pressures from rising above one-half the distance between the invert of the longitudinal metal pipe drain and the finish ground surface. The drainage system is illustrated on Plate 12.

The drainage system consists of a drainage layer beneath the floor and adjacent to the sides of the walls. This layer connects to longitudinal pipes which discharge into the channel at 20-foot intervals and also discharge through drainage holes in the floor of the concrete channel.

The drainage layer beneath the floor and up both side walls to a height of 12 inches above the longitudinal pipe will consist of compacted processed gravel (3/4" to No. 4 concrete aggregate) and at higher elevations it will consist of processed sand (No. 4 to No. 100 concrete aggregate).

Where the bottom of the excavation is in silt and sand, a 12-inch layer of compacted gravel fill is required beneath the drainage layer to provide a working floor for construction personnel and equipment and also to provide filter action with the overlying processed gravel. Where the bottom of the excavation is in gravel, the gravel fill layer is not needed, but because of the difficulty of delineating such areas prior to construction, the gravel layer will be required everywhere.

The top of the drainage layer will be protected from clogging by a 3-inch layer of processed sand laid over it to keep dirt and mortar out during construction.

It is estimated that the processed gravel material is at least 1000 times more pervious than the most pervious foundation soil, and the processed sand is at least 5 times more pervious than the most pervious backfill material which will be placed against it.

25. Earth Pressures. The description of earth fill material to be placed behind the channel walls is discussed in Section D above. Structural design computations for lateral earth pressures are based on the assumption that the U-frame structure does not yield sufficiently to develop "active" pressures and that "at rest" pressures are developed. Based on estimated shear strength values of the earth fill material and existing materials outside the excavations, it is assumed that the coefficient of earth pressure "at rest" ranges from about 0.45 to 0.55. The saturated unit weight of the backfill material is estimated to range from 110 to 140 pounds per cubic foot.

26. Construction Consideration.

a. Dewatering. The method of dewatering will not be specified in the contract since it is considered that the economy of the method used depends on factors such as construction sequence, contractor's experience, and equipment available to the contractor. Based on experience with similar conditions and soil types and on consultation with personnel of a nationally known foundation dewatering firm, it is considered feasible and practical, but not necessarily most economical, to dewater the entire reach of concrete channel by the well point method. Where the excavation is in silt, a 2 stage system may be needed to stabilize the bottom and sides of the excavation if sheeting is not used. Also, wells in silt may have to be sand packed and probably sealed at the surface to create a partial vacuum in the sand pack, thus increasing the gravitational head under whose action water will flow toward the well.

b. Shoring and Sheeting. Construction shoring and sheeting will be mandatory in certain areas and optional in other areas. The use of sheeting may be made elective to the contractor in cases where such sheeting will not only assist in the dewatering but will also support the excavation sides in confined areas. The use of shoring and sheeting will be made mandatory at selected locations where the excavation is in close proximity of railroad tracks, existing utility lines, building foundations, retaining walls, and bridge piers.

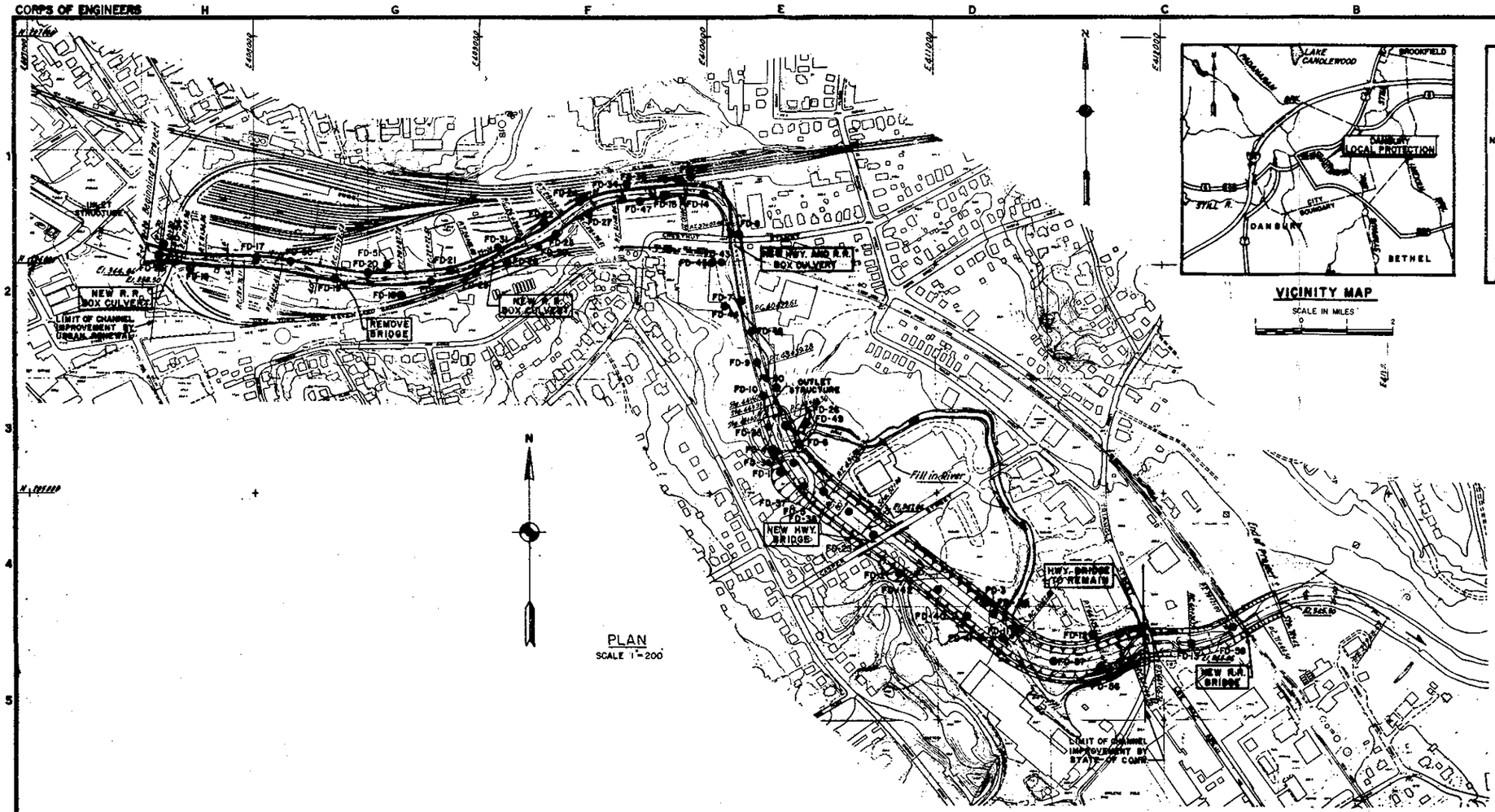
c. Construction Sequence. The sequence of construction depends on factors such as river control and diversion, construction of certain utility lines, relocation of railroad tracks, and construction of new

bridges. In certain confined areas, only one-half of the U-frame structure can be built at a time because sufficient space for river diversion is not available.

G. MATERIALS QUANTITIES

27, General. A chart showing the proposed usage of materials from required excavations and materials furnished by the contractor is shown on Plate 13.

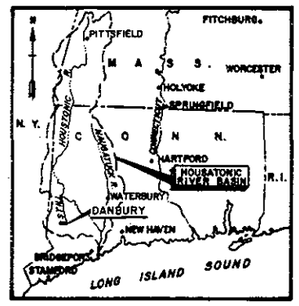
CORPS OF ENGINEERS — U.S. ARMY



VICINITY MAP

SCALE IN MILES

0 1 2



LOCATION MAP

SCALE IN MILES

16 0 16 32

NOTES

ELEVATIONS REFER TO MEAN SEA LEVEL DATUM
CONTOUR INTERVAL IS 10 FEET

LEGEND

FD FOUNDATION TEST BORING

GRAPHIC SCALE

200' 0 200' 400'
1"=200'

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

HOUSATONIC RIVER FLOOD CONTROL
DANBURY CHANNEL IMPROVEMENT
GENERAL PLAN
AND
PLAN OF FOUNDATION EXPLORATIONS
STILL RIVER CONNECTICUT

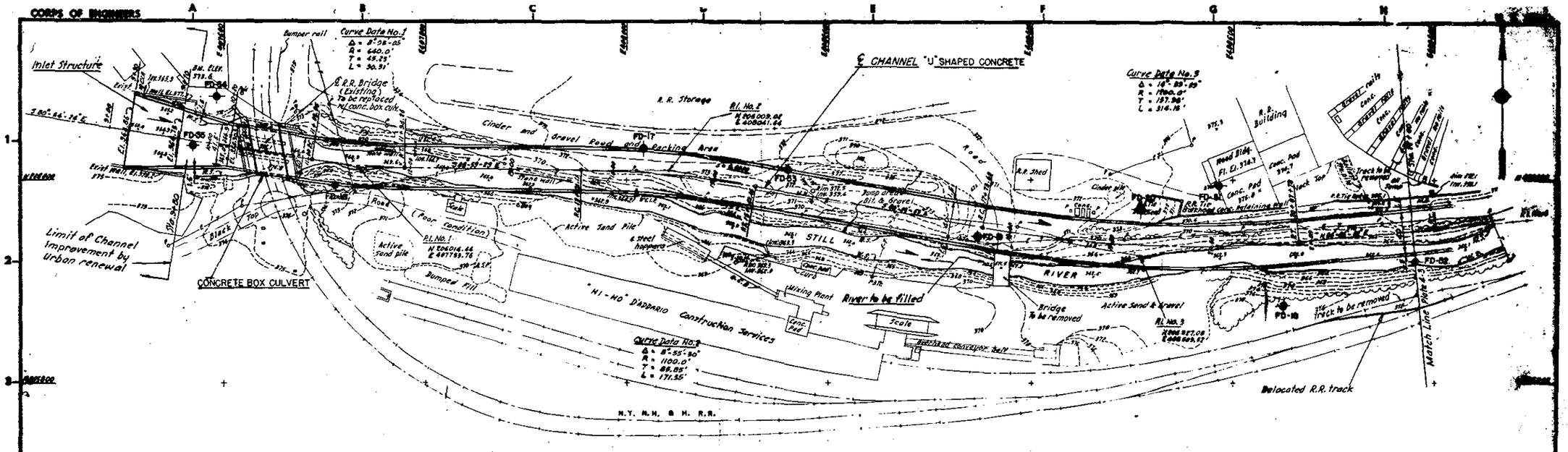
SCALE 1"=200' SPEC. NO.

HOU-

SHEET

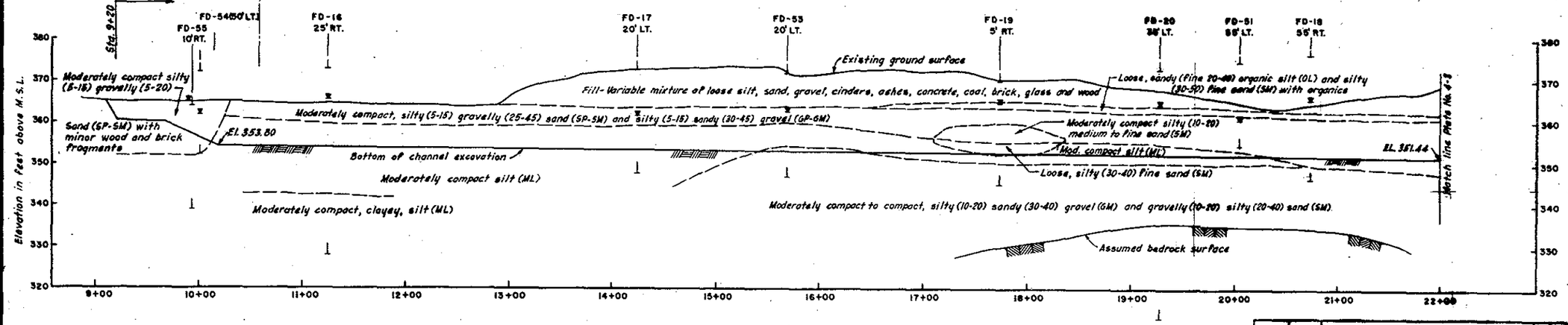
PLATE NO. 4-1

CORPS OF ENGINEERS



PLAN

SCALE: 1"=40'



PROFILE ON ℄ OF CHANNEL

SCALE: HOR. 1"=40'
VERT. 1"=10'

NOTE:
▽ Denotes water level in drill holes.

GRAPHIC SCALES

1"=10' 10' 0 10' 20'

1"=40' 80' 0 40' 80'

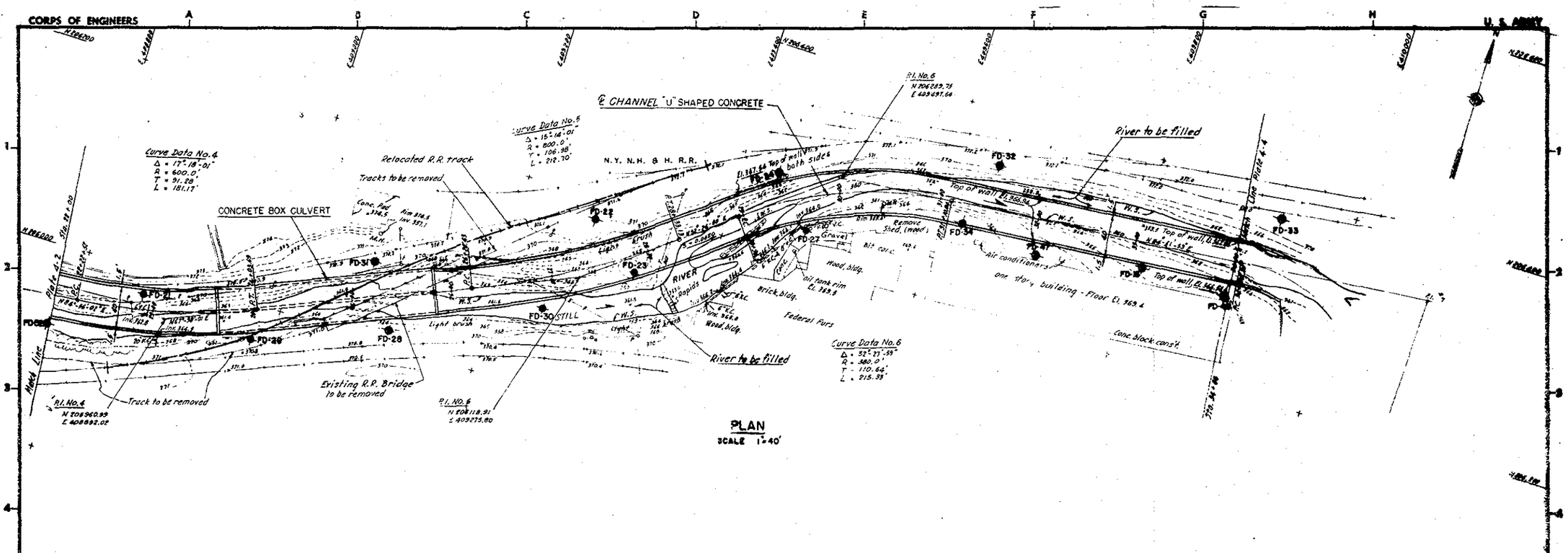
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS

HOUSATONIC RIVER FLOOD CONTROL
DANBURY CHANNEL IMPROVEMENT
PLAN AND SOILS PROFILE
STA. 9+20 TO STA. 22+00
STILL RIVER, CONNECTICUT

PLATE NO. 4-2

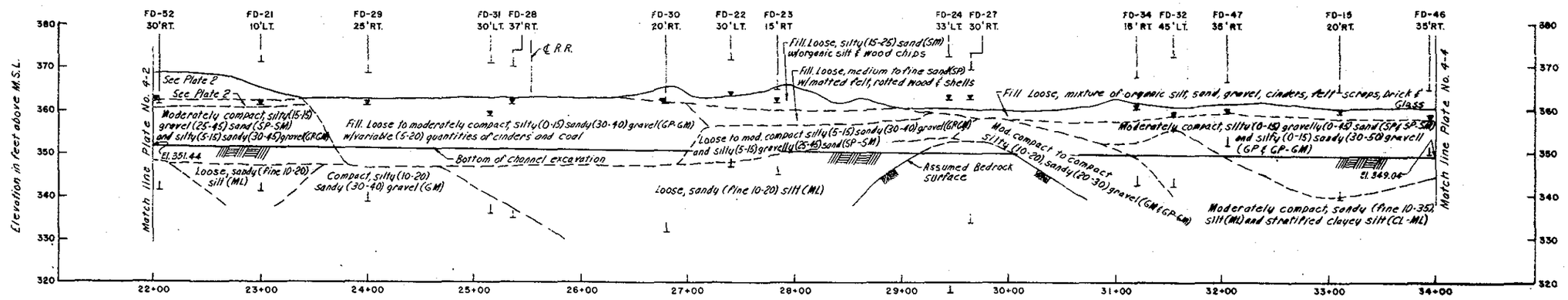
CORPS OF ENGINEERS

U. S. ARMY



PLAN

SCALE 1"=40'



PROFILE ON ℄ OF CHANNEL

SCALE: HOR. 1"=40'
VERT. 1"=10'

GRAPHIC SCALES

1"=10' 10' 0 10' 20'

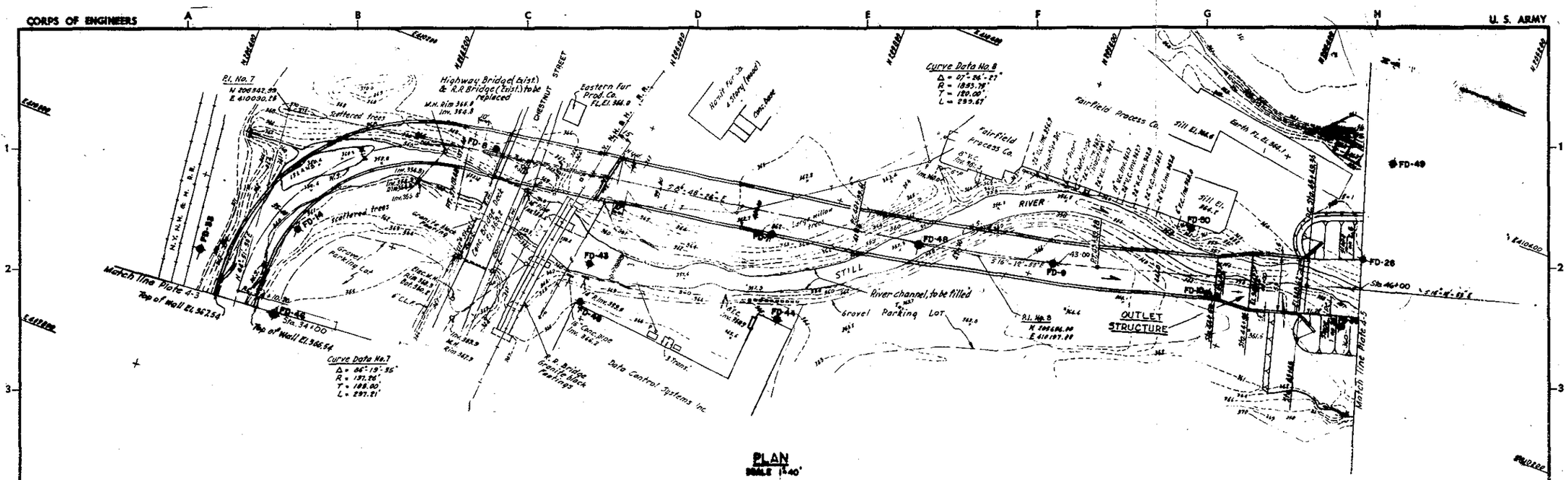
1"=40' 40' 0 40' 80'

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

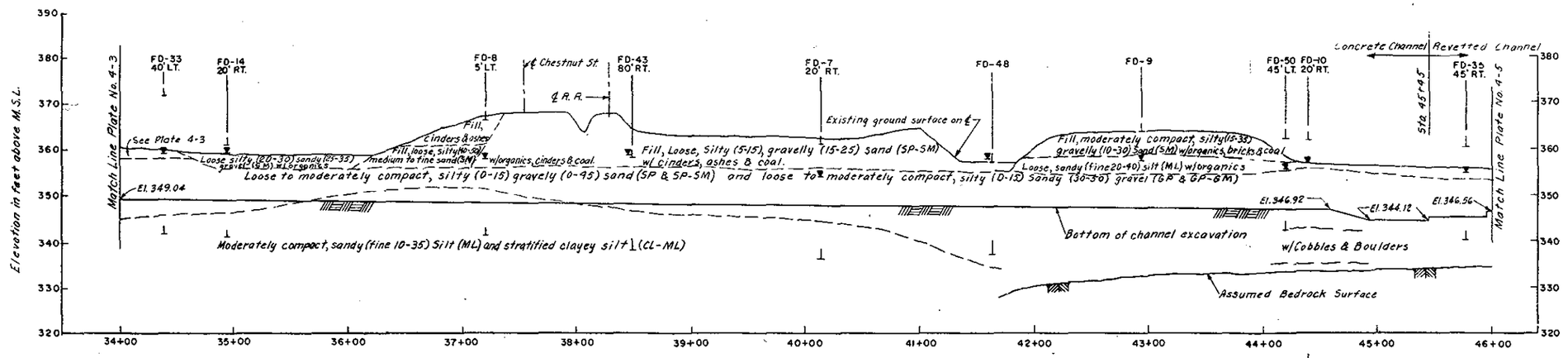
HOUSATONIC RIVER FLOOD CONTROL
DANBURY CHANNEL IMPROVEMENT
PLAN AND SOILS PROFILE
STA. 22+00 TO STA. 34+00
STILL RIVER CONNECTICUT

PLATE NO. 4-3

CORPS OF ENGINEERS — U. S. ARMY



PLAN
SCALE 1"=40'



PROFILE ON ℄ OF CHANNEL
SCALE: HOR. 1"=40'
VERT. 1"=10'

GRAPHIC SCALES
1"=10' 10' 0 10' 20'
1"=40' 40' 0 40' 80'

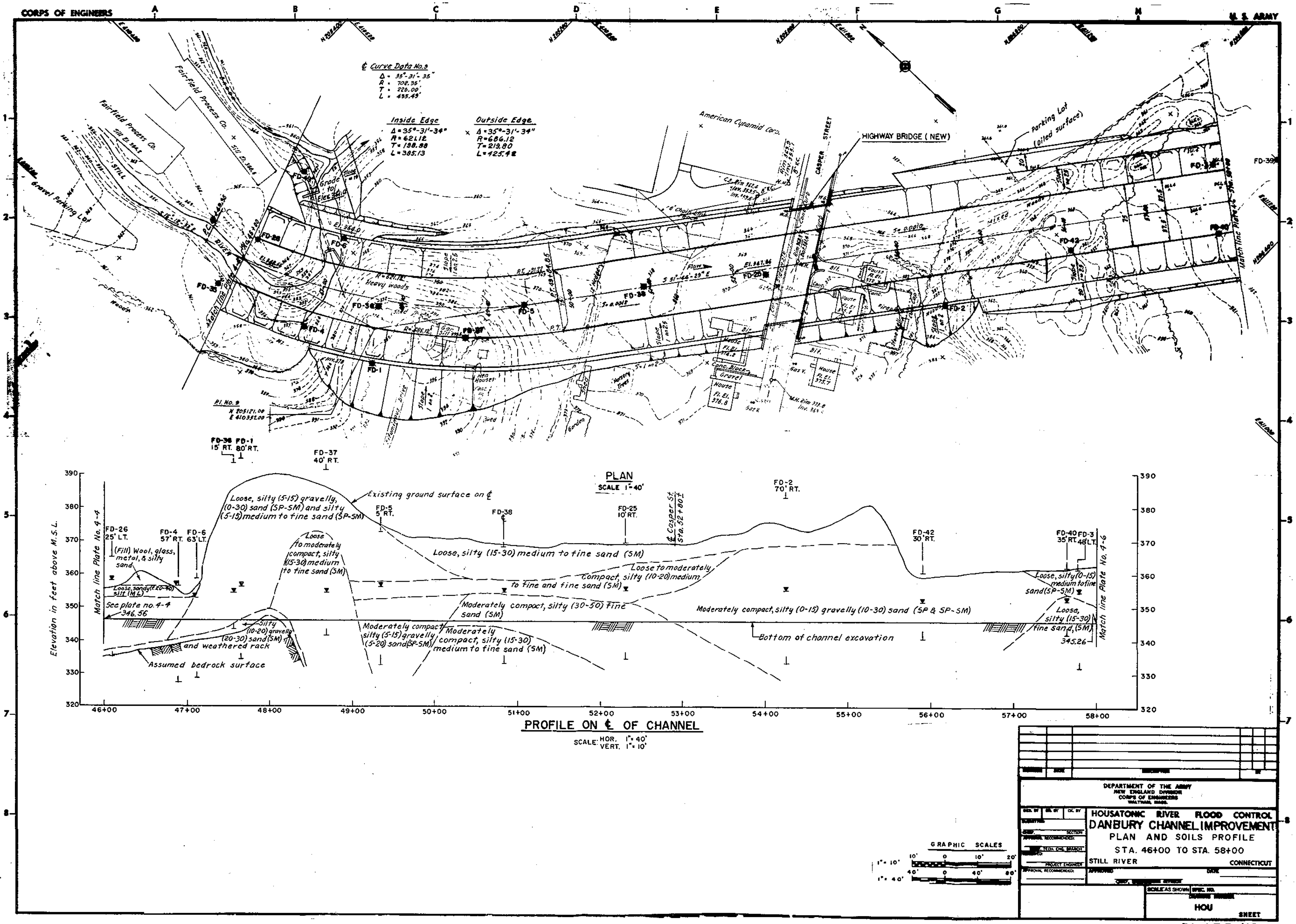
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY | DR. BY | CK. BY
SUBMITTED
CHIEF, SECTION
APPROVAL RECOMMENDED
CHIEF, TECH. DIV. BRANCH
REVISION
PROJECT ENGINEER
APPROVAL RECOMMENDED
APPROVED
CHIEF, ENGINEERING DIVISION
DATE

HOUSATONIC RIVER FLOOD CONTROL
DANBURY CHANNEL IMPROVEMENT
PLAN AND SOILS PROFILE
STA. 34+00 TO STA. 46+00
STILL RIVER CONNECTICUT

SCALE AS SHOWN | SPEC. NO.
DRAWING NUMBER
SHEET

PLATE NO. 4-4



CORPS OF ENGINEERS
U. S. ARMY
Fairfield Process Co.
Sill El. 364.8
Sill El. 366.6
Gravel Parking Lot
STILL RIVER
Woods
¢ Curve Data No. 9
Δ = 35°-31'-35"
R = 702.35'
T = 226.00'
L = 435.49'
Inside Edge
Δ = 35°-31'-34"
R = 621.12
T = 198.88
L = 385.13
Outside Edge
Δ = 35°-31'-34"
R = 686.12
T = 219.80
L = 425.42
American Cyanamid Corp.
CASPER STREET
HIGHWAY BRIDGE (NEW)
Parking Lot (oiled surface)
Heavy woods
Mixed Woods
Flow
S 51°-44'-29" E
El. 347.86
Hen Houses
Garden
Nursery Trees
Conc. Block
Gravel
House Fl. El. 376.8
House Fl. El. 374.2
House Fl. El. 375.7
M.H. Rim 373.8 Inv. 363
P.I. No. 9
N 205121.00
E 410352.00
Match line Plate 4-4
Match line Plate 4-6
FD-1
FD-2
FD-4
FD-5
FD-6
FD-20
FD-26
FD-35
FD-36
FD-37
FD-38
FD-39
FD-40
FD-42
PLAN
SCALE 1"=40'
FD-36 15' RT.
FD-1 80' RT.
FD-37 40' RT.
FD-26 25' LT.
FD-4 57' RT.
FD-6 63' LT.
FD-5 5' RT.
FD-38 ¢
FD-25 10' RT.
¢ Casper St. Sta. 52+80±
FD-2 70' RT.
FD-42 30' RT.
FD-40 35' RT.
FD-3 48' LT.
Elevation in feet above M.S.L.
Match line Plate No. 4-4
Match line Plate No. 4-6
(Fill) Wool, glass, metal, & silty sand
Loose, sandy (20-40) silt (ML)
See plate no. 4-4
346.56
Loose, silty (5-15) gravelly, (0-30) sand (SP-SM) and silty (5-15) medium to fine sand (SP-SM)
Existing ground surface on ¢
Loose to moderately compact, silty (15-30) medium to fine sand (SM)
Silty (10-20) gravelly (20-30) sand (SM) and weathered rock
Assumed bedrock surface
Loose, silty (15-30) medium to fine sand (SM)
Loose to moderately compact, silty (10-20) medium to fine and fine sand (SM)
Moderately compact, silty (30-50) fine sand (SM)
Moderately compact, silty (5-15) gravelly (5-20) sand (SP-SM)
Moderately compact, silty (15-30) medium to fine sand (SM)
Moderately compact, silty (0-15) gravelly (10-30) sand (SP & SP-SM)
Bottom of channel excavation
Loose, silty (0-15) medium to fine sand (SP-SM)
Loose, silty (15-30) fine sand (SM)
345.26
390
380
370
360
350
340
330
320
46+00
47+00
48+00
49+00
50+00
51+00
52+00
53+00
54+00
55+00
56+00
57+00
58+00
PROFILE ON ¢ OF CHANNEL
SCALE: HOR. 1"=40' VERT. 1"=10'
GRAPHIC SCALES
1"=10'
1"=40'
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.
HOUSATONIC RIVER FLOOD CONTROL
DANBURY CHANNEL IMPROVEMENT
PLAN AND SOILS PROFILE
STA. 46+00 TO STA. 58+00
STILL RIVER
CONNECTICUT
SCALE AS SHOWN
HOU
SHEET

PLATE NO. 4-5

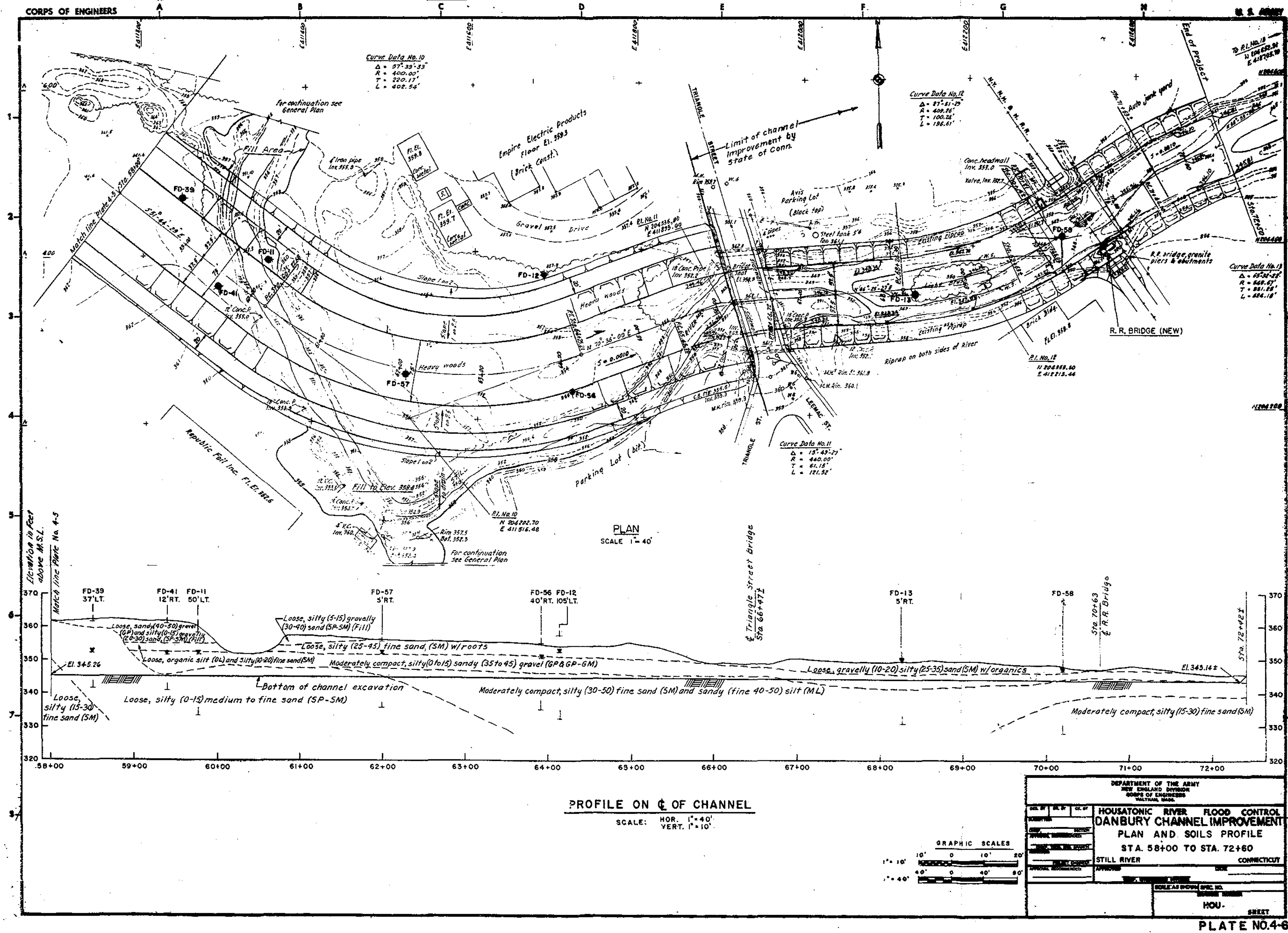
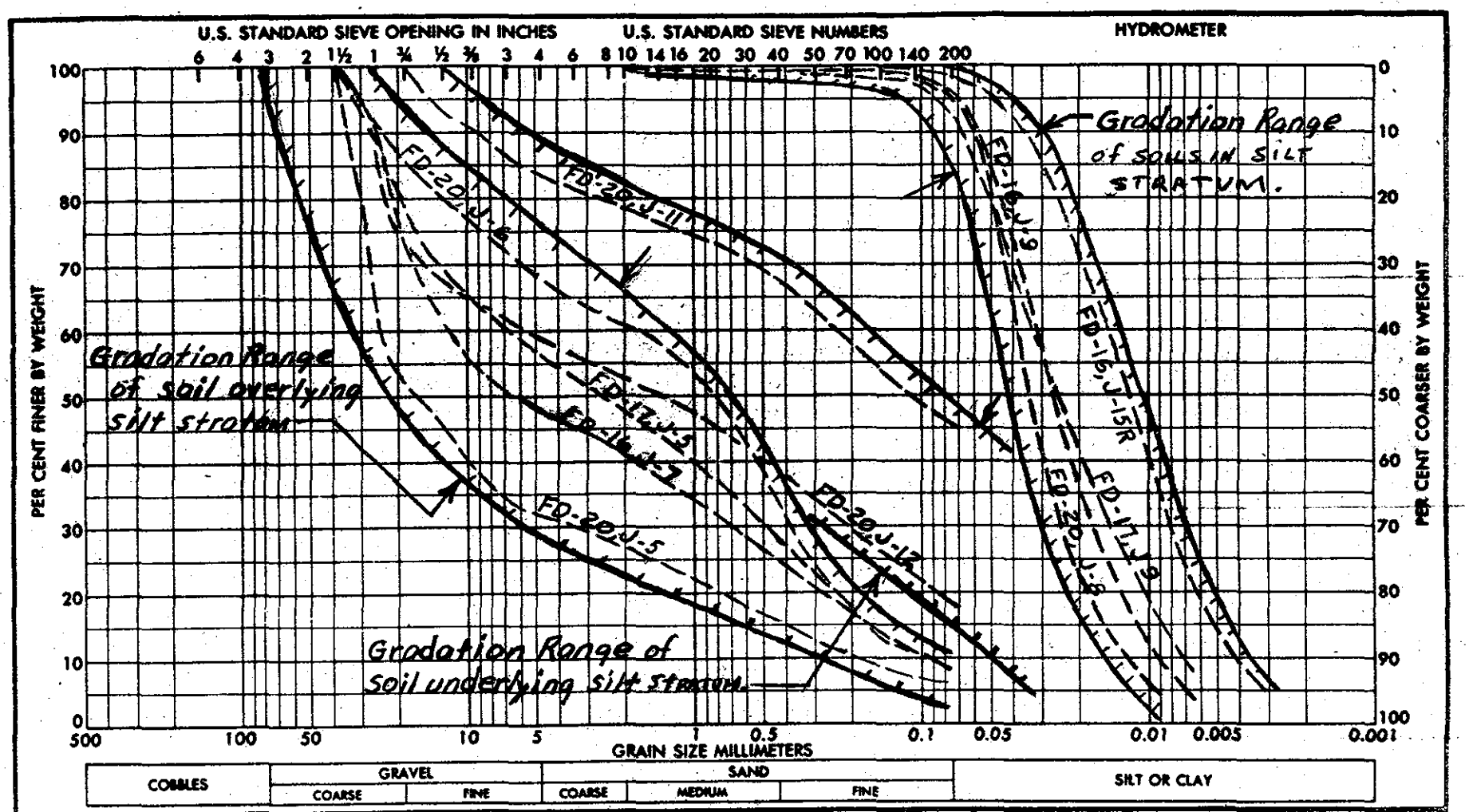

CORPS OF ENGINEERS
U. S. ARMY
Curve Data No. 10
Δ = 57°-39'-33"
R = 400.00'
T = 220.17'
L = 402.54'
For continuation see General Plan
Fill Area
Iron pipe Inv. 355.5
Empire Electric Products Floor El. 359.3 (Brick Const.)
Gravel Drive
P.I. No. 11 N 204536.80 E 411895.00
Limit of channel improvement by State of Conn.
TRIANGLE STREET
Avis Parking Lot (Black top)
Steel tank 5'Φ Top 361.1
Curve Data No. 12
Δ = 27°-51'-29"
R = 409.26'
T = 100.26'
L = 196.61'
N.Y. N.H. & H. R.R.
Auto junk yard
End of Project
Sta. 72+60
To P.I. No. 13
Conc. headwall Inv. 353.0
Valve, Inv. 352.7
R.R. bridge, granite piers & abutments
Curve Data No. 13
Δ = 65°-36'-28"
R = 549.67'
T = 351.28'
L = 624.18'
R.R. BRIDGE (NEW)
Existing riprap
Riprap on both sides of River
Brick Bldg.
Fl. El. 358.8
P.I. No. 12 N 204388.60 E 412213.44
Match line Plate 4-5 Sta. 58+00
FD-39
FD-11
FD-41
FD-12
FD-57
FD-56
FD-13
FD-58
Slope 1 on 2
Heavy woods
N 70°-36'-00" E
S = 0.0010
Light Brush
LEEMAC ST.
TRIANGLE ST.
Curve Data No. 11
Δ = 15°-49'-27"
R = 440.00'
T = 61.15'
L = 121.52'
Parking Lot (bit.)
Republic Foil Inc. Fl. El. 362.6
Fill to Elev. 359.8
P.I. No. 10 N 204202.70 E 411516.48
Rim 357.5 Bot. 352.3
For continuation see General Plan
PLAN
SCALE 1" = 40'
Elevation in Feet above M.S.L.
Match line Plate No. 4-5
FD-39 37'LT.
FD-41 12'RT.
FD-11 50'LT.
FD-57 5'RT.
FD-56 40'RT.
FD-12 105'LT.
FD-13 5'RT.
FD-58
℄ Triangle Street Bridge Sta. 66+47±
Sta. 70+63 ℄ R.R. Bridge
Sta. 72+42±
Loose, sandy (40-50) gravel (GP) and silty (0-15) gravelly (20-30) sand (SP-SM) (Fill)
Loose, silty (5-15) gravelly (30-40) sand (SP-SM) (Fill)
Loose, silty (25-45) fine sand, (SM) w/roots
Loose, organic silt (OL) and silty (10-20) fine sand (SM)
Moderately compact, silty (0 to 15) sandy (35 to 45) gravel (GP & GP-GM)
Loose, gravelly (10-20) silty (25-35) sand (SM) w/organics
El. 345.26
El. 345.14±
Bottom of channel excavation
Loose, silty (15-30) fine sand (SM)
Loose, silty (0-15) medium to fine sand (SP-SM)
Moderately compact, silty (30-50) fine sand (SM) and sandy (fine 40-50) silt (ML)
Moderately compact, silty (15-30) fine sand (SM)
370
360
350
340
330
320
58+00
59+00
60+00
61+00
62+00
63+00
64+00
65+00
66+00
67+00
68+00
69+00
70+00
71+00
72+00
PROFILE ON ℄ OF CHANNEL
SCALE: HOR. 1" = 40' VERT. 1" = 10'
GRAPHIC SCALES
1" = 10'
1" = 40'
DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.
HOUSATONIC RIVER FLOOD CONTROL
DANBURY CHANNEL IMPROVEMENT
PLAN AND SOILS PROFILE
STA. 58+00 TO STA. 72+60
STILL RIVER
CONNECTICUT
SCALE AS SHOWN
HOU-
SHEET

PLATE NO. 4-6



SAMPLE NO.	ELEV OR DEPTH	CLASSIFICATION	NAT W%	LL	PL	PI

GRADATION CURVES

PROJECT DANBURY LOCAL PROTECTION

SELECTED TEST DATA

AREA GRADATION RANGE

BORING NO. STA. 9+20 to 21+00

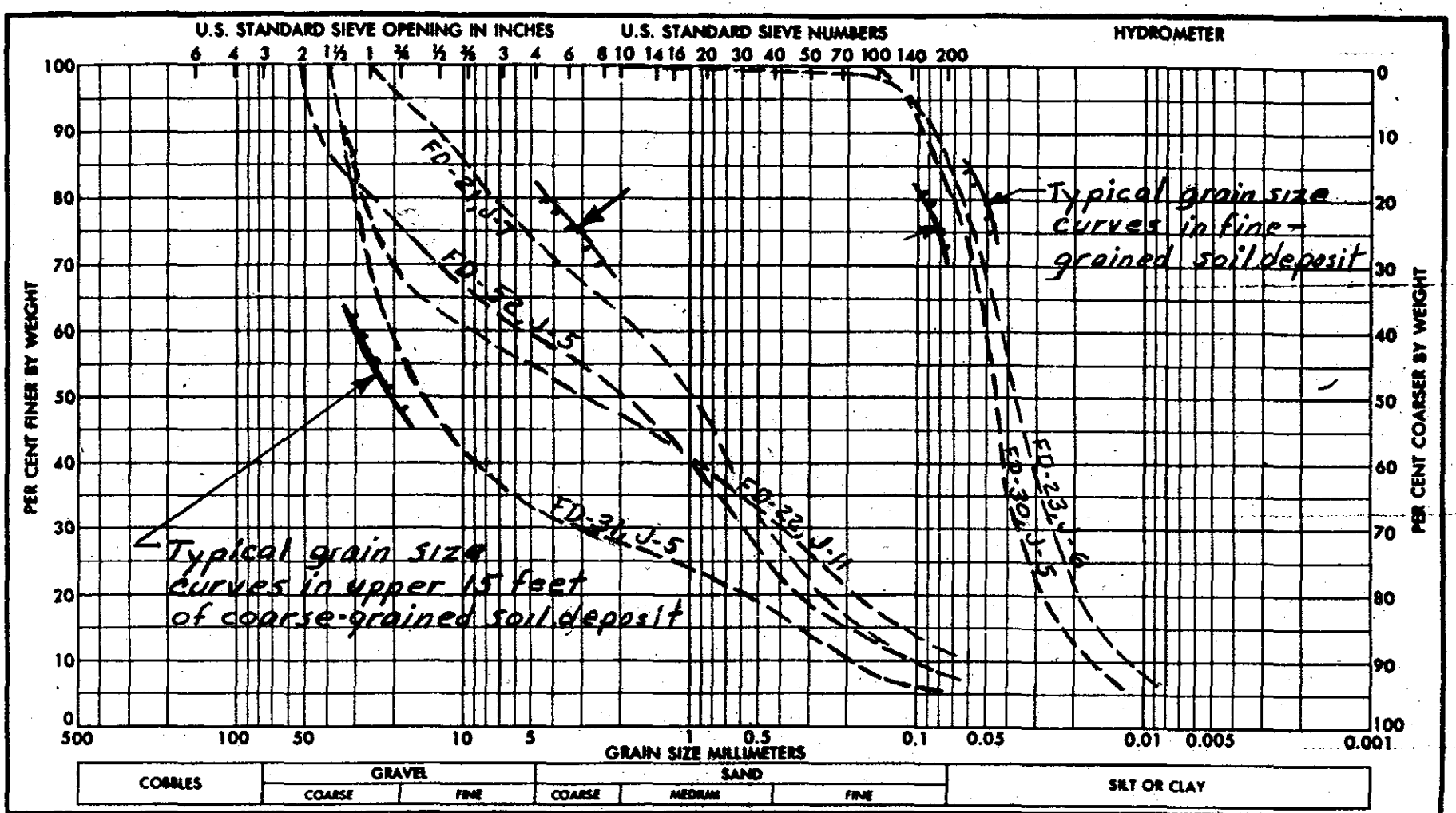
DATE

ENG FORM 2087
1 MAY 63

REPLACES WES FORM NO. 1241, SEP 1962, WHICH IS OBSOLETE.

U.S. GOVERNMENT PRINTING OFFICE : 1963 OF—709-126

PLATE No. 4-7



SAMPLE NO.	ELEV OR DEPTH	CLASSIFICATION	NAT W%	LL	PL	PI

GRADATION CURVES

PROJECT DANBURY LOCAL PROTECTION

SELECTED TEST DATA

AREA TYPICAL GRAIN SIZE CURVES

BORING NO. STA 21+00 to 31+00

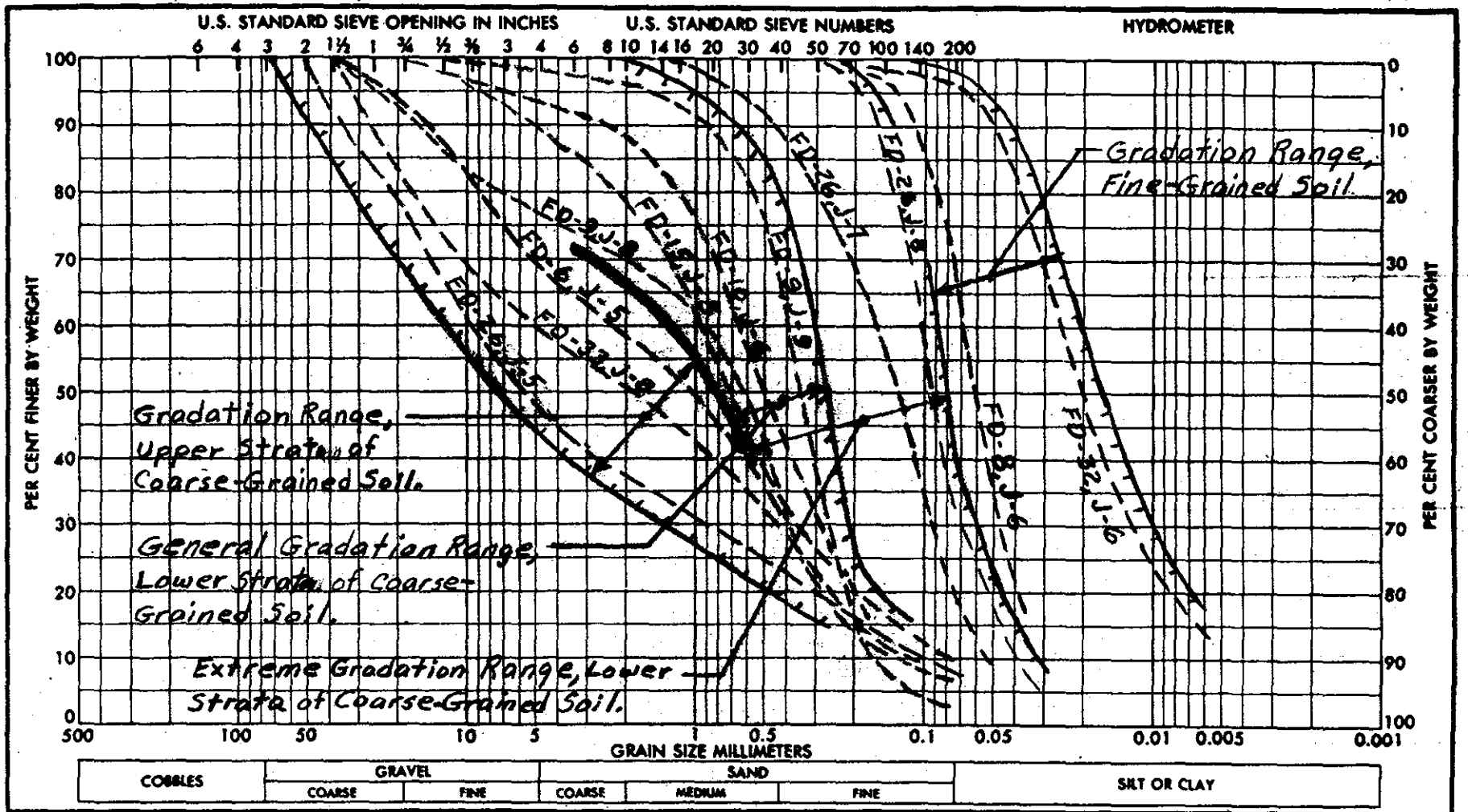
DATE

PLATE NO. 4-8

ENG FORM 2087
1 MAY 63

REPLACES WES FORM NO. 1241, SEP 1962, WHICH IS OBSOLETE.

U.S. GOVERNMENT PRINTING OFFICE : 1963 OF—700-126



SAMPLE NO.	ELEV OR DEPTH	CLASSIFICATION	NAT W%	LL	PL	PI

GRADATION CURVES

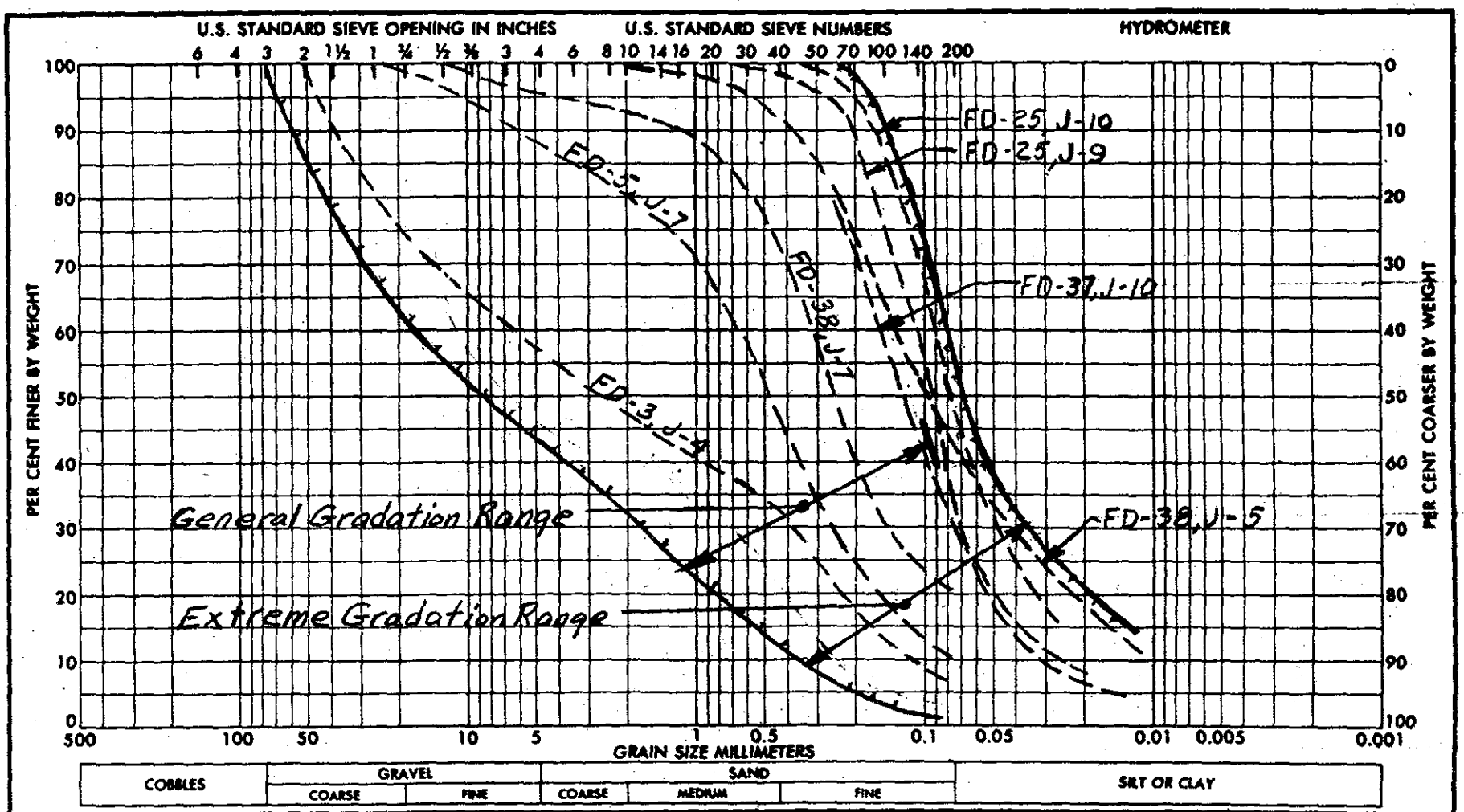
PROJECT DANBURY LOCAL PROTECTION
SELECTED TEST DATA
AREA GRADATION RANGE
BORING NO. STA 31+00 to 47+00
DATE

PLATE NO. 4-9

ENG FORM 2087
1 MAY 63

REPLACES WES FORM NO. 1241, SEP 1962, WHICH IS OBSOLETE.

U.S. GOVERNMENT PRINTING OFFICE : 1963 OF—709-126



SAMPLE NO.	ELEV OR DEPTH	CLASSIFICATION	NAT W%	LL	PL	PI

GRADATION CURVES

PROJECT DANBURY LOCAL PROTECTION

SELECTED TEST DATA

AREA TYPICAL GRAIN SIZE CURVES

BORING NO. STA 47+00 to 57+00

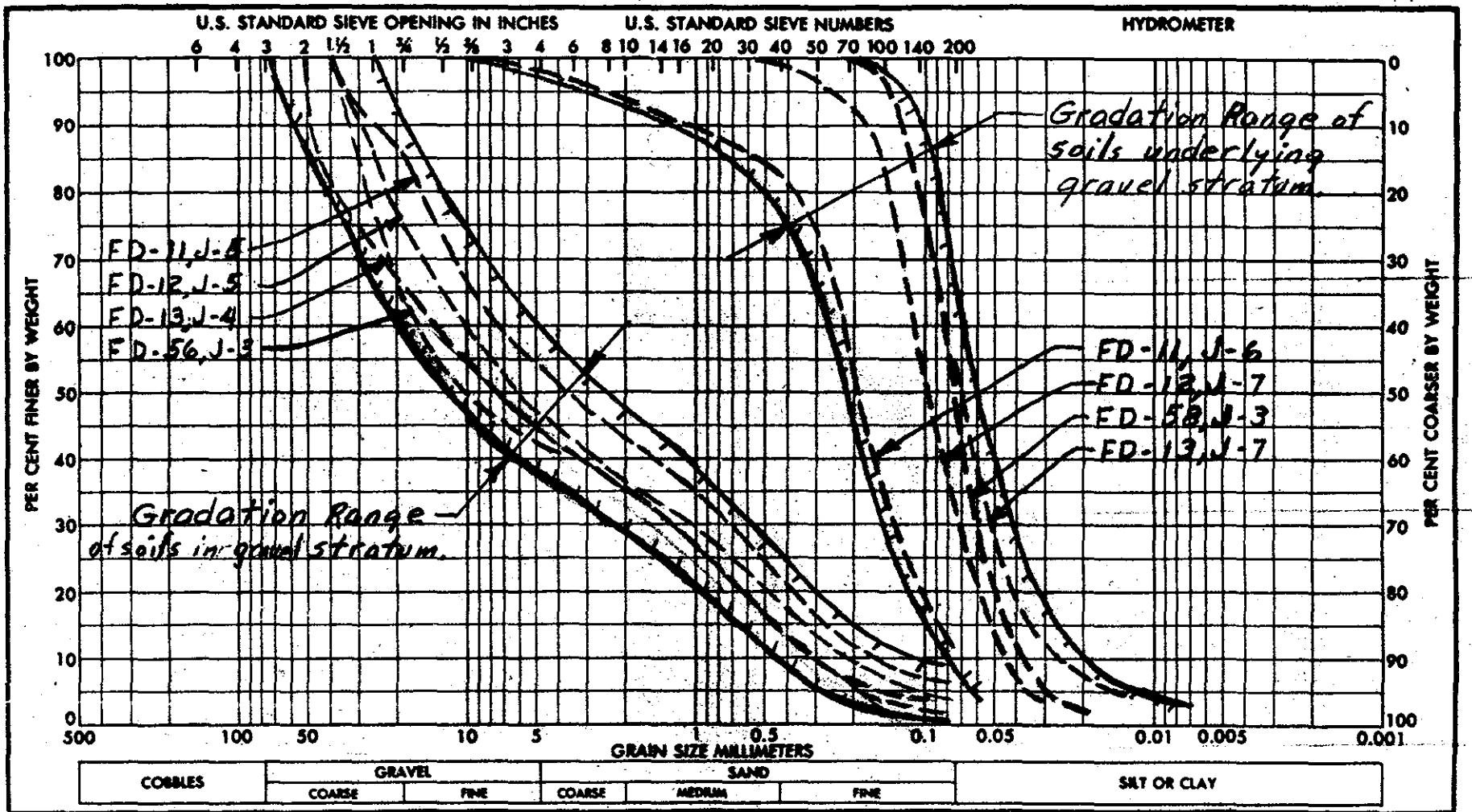
DATE

PLATE NO. 4-10

ENG FORM 2087
1 MAY 63

REPLACES WES FORM NO. 1241, SEP 1962, WHICH IS OBSOLETE.

U.S. GOVERNMENT PRINTING OFFICE : 1963 OF—709-126



SAMPLE NO.	ELEV OR DEPTH	CLASSIFICATION	NAT W%	LL	PL	PI

GRADATION CURVES

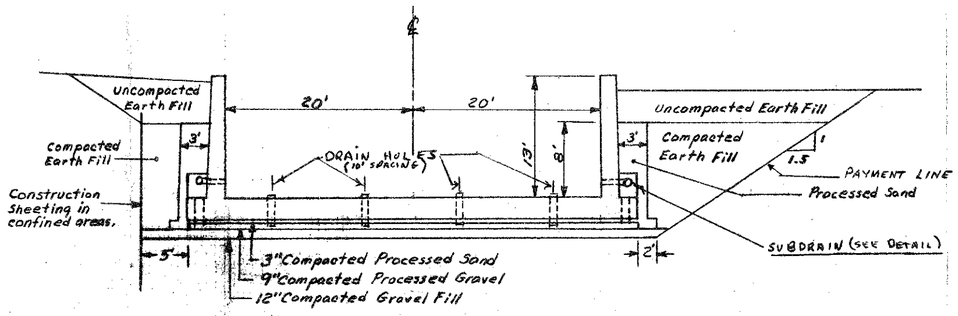
PROJECT DANBURY LOCAL PROTECTION
SELECTED TEST DATA
AREA GRADATION RANGE
BORING NO. STA. 59+00 to 72+00
DATE

ENG FORM 2087
1 MAY 63

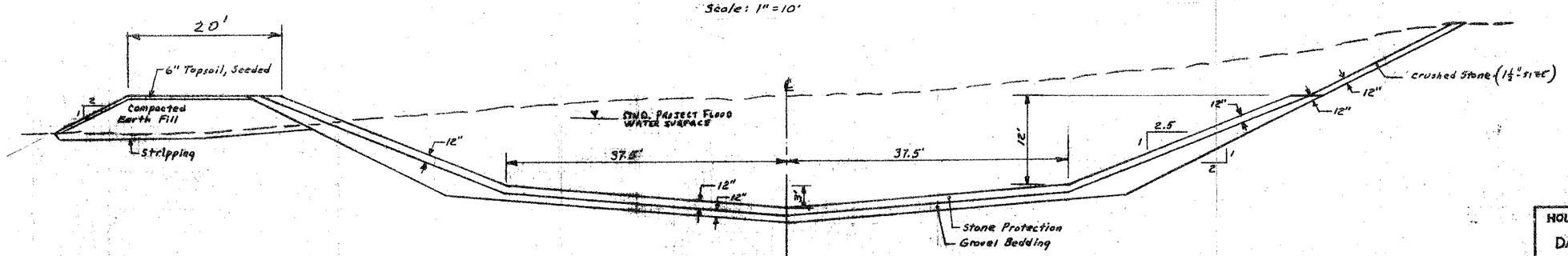
REPLACES WES FORM NO. 1241, SEP 1962, WHICH IS OBSOLETE.

U.S. GOVERNMENT PRINTING OFFICE : 1963 OF—709-126

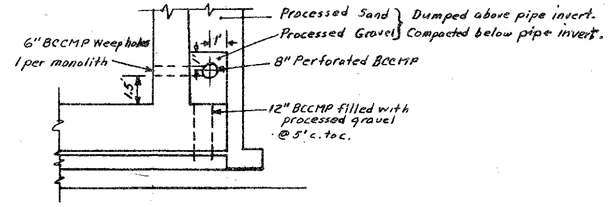
PLATE NO. 4-11



TYPICAL SECTION
CONCRETE CHANNEL
Scale: 1" = 10'



TYPICAL SECTION
REVETTED CHANNEL
Scale 1" = 10'



SUBDRAIN DETAIL
Scale 1" = 5'

HOUSATONIC RIVER FLOOD CONTROL
DANBURY LOCAL PROTECTION
TYPICAL SECTIONS
STILL RIVER DANBURY, CONN.

PLATE NO. 4-12

NED FORM 223
27 Sept 49

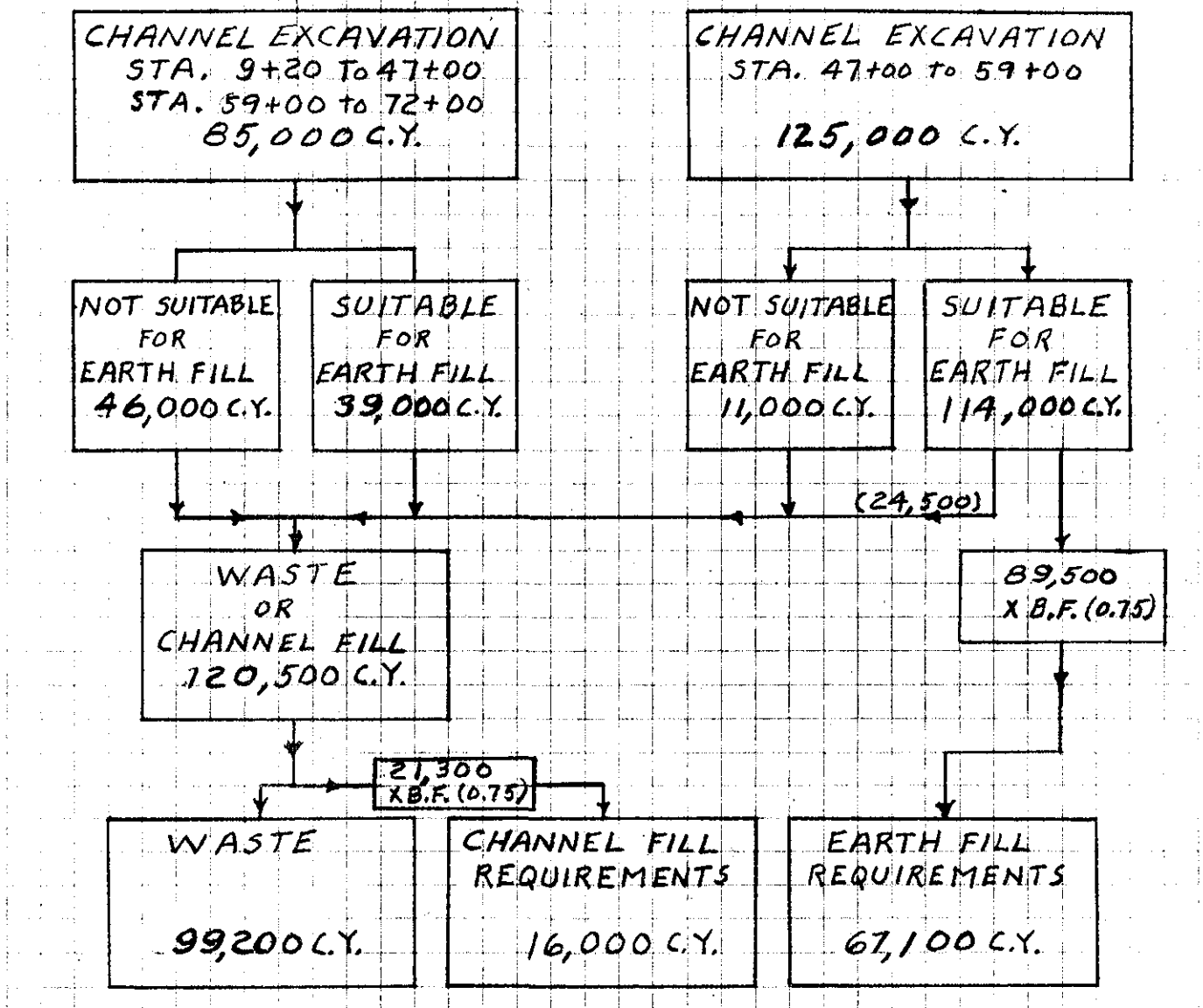
NEW ENGLAND DIVISION
CORPS OF ENGINEERS, U. S. ARMY

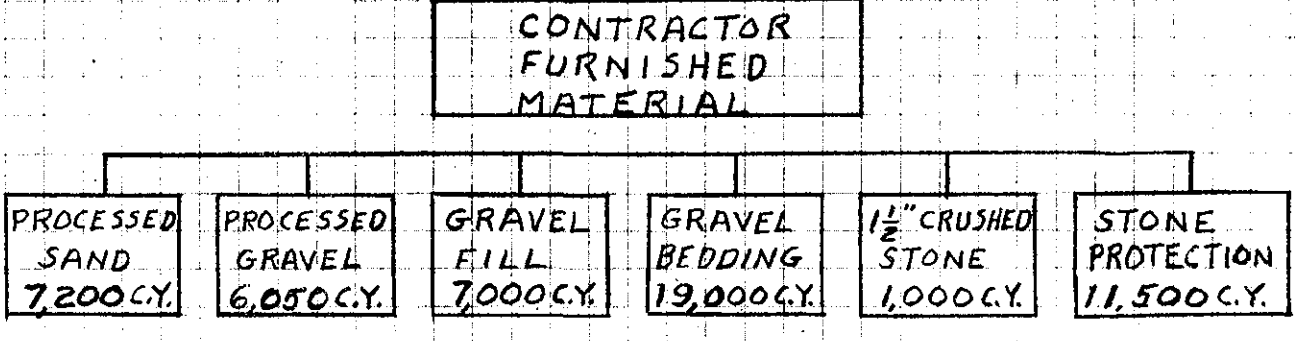
PAGE _____

SUBJECT DANBURY LOCAL PROTECTION

COMPUTATION MATERIAL USAGE CHART - PRELIMINARY

COMPUTED BY JMA CHECKED BY _____ DATE 3-14-69





B. F. = BALANCE FACTOR.

PLATE NO. 4-13

APPENDIX A

SUMMARY OF LABORATORY TEST RESULTS

DANBURY, CONN. LOCAL PROTECTION

SOIL TESTS RESULTS

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA			NAT. DRY DENSITY LBS/CUFT		OTHER TESTS			
					GRAVEL %	SAND %	FINES %	D_{10} mm.	LL	PL		TOTAL	-NO4	STND. AASHO OPT. WATER % DRY WT	STND. AASHO MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL.	PERM.	
FD-1	394.9	J-3	5.0-10.0	SP	21	74	5	0.17														
		J-4	10.0-15.0	SP-SM	30	63	7	0.15														
		J-9	25.0-26.0	SM	36	51	13	0.05														
FD-2	383.1	J-3	5.0- 6.5	SM	0	81	19	0.045														
		J-4	6.5-10.0	SP-SM	26	67	7	0.12														
		J-5	10.0-11.7	SP-SM	0	88	12	0.075														
		J-8	20.0-25.0	SP-SM	16	75	9	0.09														
		J-11	35.0-40.0	SP-SM	16	77	7	0.10														
FD-3	361.5	J-2	0.7- 5.0	SP-SM	16	75	9	0.09														
		J-4	6.3-10.0	SP-SM	44	49	7	0.12														
		J-6	15.0-20.0	SP-SM	38	55	7	0.12														
FD-5	372.7	J-3	2.7- 5.0	SP-SM	23	72	5	0.18														
		J-5	7.0- 9.3	SP-SM	0	88	12	0.07														
		J-7	10.0-15.0	SP-SM	13	76	11	0.07														
		J-8	15.0-20.0	SM	0	87	13	0.065														
		J-9	20.0-24.5	SP-SM	7	85	8	0.10														
		J-11	25.0-30.0	SP-SM	17	74	9	0.08														
FD-6	358.6	J-5	7.3-10.0	SP-SM	31	60	9	0.10														
		J-7	12.5-15.0	SP-SM	27	64	9	0.10														
FD-7	361.1	J-5	5.0-10.0	GP-GM	51	42	7	0.15														
		J-6	10.0-15.0	SP-SM	9	81	10	0.074														
FD-8	366.6	J-4	5.0-10.0	SM	7	46	47															
		J-5	10.0-15.0	SP-SM	11	82	7	0.13														
		J-6	15.0-20.0	ML	0	33	67	0.03														

T-7

NED FORM JUL 63 510

* PROVIDENCE VIBRATED DENSITY TEST

DANBURY

SOIL TESTS RESULTS

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA			NAT. DRY DENSITY LBS/CUFT		OTHER TESTS		
					GRAVEL %	SAND %	FINES %	D_{10} mm.	LL	PL		TOTAL	-NO4	STND. AASHO OPT. WATER % DRY WT	STND. AASHO MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL.	PERM.
FD-9	364.1	J-6	8.5-10.0	SP-SM	0	92	8	0.10													
		J-7	10.0-12.5	GP-GM	50	45	5	0.20													
		J-8	12.5-15.0	SP-SM	24	70	6	0.14													
		J-9	15.0-16.5	SP	2	96	2	0.17													
FD-10	362.1	J-4	6.0-10.0	SP	46	50	4	0.18													
		J-6	10.5-15.0	SP-SM	7	86	7	0.13													
FD-11	358.2	J-2	0.5- 4.0	SP-SM	35	55	10	0.074													
		J-3	4.0- 5.0	SM	3	70	27	0.02													
		J-4	5.0- 6.0	SM	7	66	27	0.02													
		J-5	6.0-10.0	GP-GM	47	46	7	0.15													
		J-6	10.0-14.0	SP-SM	2	86	12	0.07													
FD-12	357.5	J-2	0.8- 2.5	GP-GM	52	40	8	0.10													
		J-3	2.5- 4.5	SW-SM	5	83	12	0.06													
		J-5	5.0- 8.5	GP	54	42	4	0.20													
		J-7	10.0-15.0	SM	0	67	33	0.045													
FD-13	350.8	J-4	5.0- 9.5	GP	57	40	3	0.32													
		J-6	10.0-15.0	ML	2	44	54	0.025													
		J-7	15.0-20.0	ML	2	45	53	0.025													
FD-14	361.2	J-4	5.0- 6.0	SM	0	87	13	0.06													
		J-6	7.5-10.0	SP-SM	6	84	10	0.09													
		J-8	11.5-14.5	SM	7	55	38														
		J-9	14.5-15.0	ML					31	27											
FD-15	364.3	J-4	6.5-10.0	GP-GM	48	46	6	0.18													
		J-5	10.0-11.5	SP-SM	8	84	8	0.11													
		J-6	11.5-15.0	SP-SM	33	58	9	0.10													
		J-8	18.0-20.0	SW-SM	12	78	10	0.074													

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EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA			NAT. DRY DENSITY LBS/CUFT		OTHER TESTS			
					GRAVEL %	SAND %	FINES %	D_{10} mm.	LL	PL		TOTAL	-NO4	STND. AASHO OPT. WATER % DRY WT	STND. AASHO MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL.	PERM.	
FD-16	373.0	J-7	10.0-13.5	GP-GM	52	40	8	0.09														
		J-9	15.0-20.0	ML	0	4	96	0.009	NP	NP		28.0	28.0									
		J-11R	20.0-25.0	ML								27.1	27.1									
		J-13R	25.0-30.0	ML								31.7	31.7									
		J-15R	30.0-35.0	ML	0	2	98	0.004	30	24		31.2	21.2									
		J-17R	35.0-40.0	ML								36.4	36.4									
FD-17	372.8	J-3	5.0- 9.0	SM	2	60	38	0.013														
		J-5	10.0-13.5	SP-SM	45	46	9	0.09														
		J-7	15.0-20.0	ML	0	4	96	0.004	NP	NP												
		J-8R	15.0-20.0	ML								28.0	28.0									
		J-9	20.0-25.0	ML	0	7	93	0.007	NP	NP		29.0	29.0									
FD-18	376.4	J-3	5.0- 9.5	SP-SM	3	89	8	0.085														
		J-6	11.0-14.0	SM	16	58	26	0.030														
		J-8	15.0-19.0	SM	30	57	13	0.050														
		J-10	20.0-25.0	ML	2	47	51	0.015														
FD-19	370.1	J-5	6.5-10.0	GP-GM	48	44	8	0.10														
		J-6	10.0-15.0	SM	2	85	13	0.06														
		J-8	17.5-20.0	ML	0	10	90	0.011														
FD-20	373.0	J-5	10.0-12.5	GP-GM	68	25	7	0.18														
		J-6	12.5-15.0	SP-SM	32	60	8	0.10														
		J-8	17.7-20.0	ML	0	5	95	0.012	NP	NP												
		J-10	20.0-22.5	ML	0	7	93	0.009	NP	NP		26.7	26.7									
		J-11	22.5-25.0	SM	17	38	45															
		J-12	26.0-30.0	GM	42	41	17	0.03														
FD-21	371.1	J-6	10.0-15.0	SM	39	47	14	0.05														
		J-7	15.0-20.0	SW-SM	28	64	8	0.10														
		J-8	20.0-24.0	GM	52	40	8	0.12														

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EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA STND. AASHO			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS			
					GRAVEL %	SAND %	FINES %	D_{10} mm.	LL	PL		TOTAL	-NO4	OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL.	PERM.	
FD-22	361.8	J-8	15.0-17.5	GP-GM	63	30	7	0.15														
		J-9	17.5-20.0	SM	3	80	17	0.04														
		J-11	21.5-24.0	GP-GM	53	35	12	0.06														
FD-23	364.9	J-5	10.0-15.0	GW	66	29	5	0.20														
		J-6	15.0-20.0	ML	0	13	87	0.013														
FD-24	372.7	J-6	15.0-19.0	SP-SM	43	50	7	0.13														
FD-25	369.6	J-5	5.0- 6.5	SM	14	68	18	0.035														
		J-6	6.5-10.0	SM	0	85	15	0.06														
		J-8	15.0-18.5	SM	1	85	14	0.07														
		J-9	18.5-20.0	SM	0	65	35	0.03														
		J-10	20.0-25.0	SM	0	52	48	0.018				26.2	26.2									
FD-26	365.1	J-4	6.5-10.0	ML	0	40	60	0.006														
		J-5	10.0-14.5	GP-GM	54	38	8	0.10														
		J-7	15.0-20.0	SM	0	79	21	0.05														
		J-8	20.0-25.0	SM	0	66	34	0.04														
FD-27	369.7	J-5	11.5-12.9	GM	46	36	18	0.02														
FD-28	370.3	J-3	5.0- 8.8	SP-SM	36	55	9	0.08														
		J-5	10.0-15.0	SP-SM	33	55	12	0.06														
		J-7	20.0-21.9	SP-SM	35	55	10	0.07														
		J-8	21.9-25.0	ML	0	6	94	0.013														
FD-29	368.9	J-3	5.0-10.0	GP	72	25	3	0.10														
		J-5	12.3-15.0	SM	35	49	16															
		J-9	25.0-30.0	GM	53	33	14	0.05														

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EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA STND. AASHO			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS		
					GRAVEL %	SAND %	FINES %	D_{10} mm.	LL	PL		TOTAL	- NO4	OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	- NO4	SHEAR	CONSOL.	PERM.
FD-30	361.7	J-3	10.0-14.5	SP-SM	40	53	7	0.11													
		J-5	15.0-20.0	ML	0	16	84	0.015				22.2	22.2								
FD-31	371.1	J-5	12.4-15.0	GP-GM	68	27	5	0.02													
		J-7	20.0-25.0	GP-GM	46	46	8	0.01													
FD-32	372.2	J-5	15.0-17.4	GP-GM	47	46	7	0.01													
		J-6	17.4-20.0	ML	0	4	96	0.005													
		J-7	20.0-25.0	ML	0	30	70	0.015													
FD-33	371.9	J-3	5.0- 9.5	SP-SM	0	92	8	0.08													
		J-8	15.0-20.0	SP-SM	41	51	8	0.12													
		J-9	20.0-25.0	SP-SM	44	44	12	0.05													
FD-34	367.8	J-5	15.0-18.7	ML	0	12	88	0.013													
		J-7	20.0-25.0	GP-GM	56	32	12	0.05													
FD-35	360.5	J-5	10.0-15.0	SW-SM	22	71	7	0.13													
FD-36	393.4	J-1	1.1- 5.0	SW	7	89	4	0.18													
		J-3	10.0-15.0	SW-SM	18	72	10	0.08													
		J-5	20.0-25.0	SM	15	72	13	0.05													
		J-6	25.0-30.0	GP-GM	49	41	10	0.06													
		J-9	40.0-45.0	SP-SM	0	90	10	0.08													
FD-37	391.4	J-1	1.1- 5.0	SW-SM	13	79	8	0.11													
		J-3	10.0-14.1	SP-SM	27	66	7	0.11													
		J-5	15.0-16.4	SM	0	82	18	0.04													
		J-7	20.0-25.0	SM	0	85	15	0.04													
		J-10	30.0-35.0	SM	0	71	29	0.025													
		J-11	35.0-40.0	SM	0	78	22	0.04													
		J-14	45.0-50.0	SM	2	78	20	0.043													

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EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA STND. AASHO			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS		
					GRAVEL %	SAND %	FINES %	D_{10} mm.	LL	PL		TOTAL	-NO4	OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL.	PERM.
FD-38	368.0	J-2	5.0-10.0	SM	2	76	22	0.04													
		J-3	10.0-14.2	SP-SM	0	88	12	0.07													
		J-5	15.0-20.0	SM	0	58	42	0.01													
		J-7	25.0-27.5	SM	5	75	20	0.02													
FD-39	361.6	J-2	1.9- 5.0	SP-SM	3	90	7	0.01													
		J-5	10.0-15.0	SP-SM	8	85	7	0.09													
		J-6	15.0-17.3	SM	2	86	12	0.06													
FD-40	361.9	J-3	5.0- 8.2	SP	0	97	3	0.15													
		J-5	10.0-15.0	SM	0	83	17	0.05													
FD-41	361.0	J-1	0.1- 5.0	SP-SM	23	69	8	0.12													
		J-6	10.0-15.0	GP	54	43	3	0.25													
FD-42	360.5	J-2	5.0-10.0	SP-SM	12	77	11	0.07													
FD-43	358.3	J-5	11.2-15.0	ML	0	32	68	0.02													
FD-48	357.4	J-2	1.9- 5.0	GP-GM	51	42	7	0.15													
		J-4	5.9-10.0	SP-SM	10	83	7	0.14													
FD-49	363.3	J-5	10.0-13.9	SP-SM	33	58	9	0.08													
		J-7	15.0-17.9	CL-ML	0	23	77	0.004	29	22											
FD-52	361.6	J-5	10.0-14.1	SP-SM	42	51	7	0.110													
FD-53	371.9	J-5	12.1-15.0	ML	0	3	97	.0065													
FD-54	372.1	J-4	10.9-15.0	ML	0	3	97	.008													

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SOIL TESTS RESULTS

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS			
					GRAVEL %	SAND %	FINES %	D_{10} mm.	LL	PL		TOTAL	-NO4	STND. AASHO OPT. WATER % DRY WT	STND. AASHO MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL.	PERM.	
FD-55	364.0	J-3	7.1-10.0	SM	21	63	16	0.004														
		J-6	15.0-20.0	ML	0	2	98	0.009														
FD-56	355.4	J-3	5.0- 9.1	GP	58	40	2	0.35														
FD-57	355.6	J-2	4.1- 5.0	GP	58	39	3	0.25														
FD-58	347.5	J-3	5.0-10.0	ML	0	48	52	.035														

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DANBURY

APPENDIX B

ENGINEERING LOGS OF SOILS EXPLORATIONS

DANBURY, CONN. LOCAL PROTECTION

CONTENTS

APPENDIX B

ENGINEERING LOGS OF SOILS EXPLORATIONS

DANBURY, CONN. LOCAL PROTECTION

LEGEND

occ.	occasional
lt.	light
dk.	dark
mod.	moderately
v.	very
comp.	compact
w/	with
f.	fine
m.	medium
c.	coarse
m-f	medium to fine
SM	Soil Symbol, Unified Soil Classification System.
W_n	Natural Water content of total sample.
W_4	Natural water content determined for that portion of the soil passing the No. 4 U. S. Standard Sieve.
D_{10}	Effective grain size in millimeters.
LL	Atterberg Liquid Limit
PI	Atterberg Plasticity Index
26	A single numeral following a soil component in the description of a soil represents the percentage, by weight, of that component in the soil as determined by a mechanical analysis.
(25-35)	A range of numbers in parenthesis following a soil component in the description of a soil, represents the estimated limits between which lies the percentage, by weight, of that component in the soil as determined by visual inspection.

FD-1 Elev. 394.9

0.0' - 0.6'	Topsoil
0.6' - 2.0'	Fill. Br., Loose, silty, (20-30) sand, SM, w/10-20% gravel size coal and cinder fragments and organics.
2.0' - 5.0'	Fill. Br., Loose, gravelly (10-20) silty (15-25) sand, SM, w/minor organics, brick and pottery fragments.
5.0' - 10.0'	Very light brown, mod. comp. gravelly 21 sand, SP. D_{10} = 0.17
10.0' - 20.0'	Light brown, mod. compact, silty 7, gravelly 30 sand, SP-SM. Gravel sizes mostly 1/2" to #4. D_{10} = 0.15
20.0' - 22.3'	Lt. brown, mod. compact, silty (5-15) gravelly (20-30) sand, SP-SM.
22.3' - 24.5'	Brown, mod. compact, silty (5-10) gravelly (10-20) sand, w/minor fragments of coal and glass.
24.5' - 26.0'	Lt. brown, compact, silty 13 gravelly 36 sand, SM. D_{10} = 0.05
26.0' - 27.5'	Brown, mod. compact, silty (20-30) sand, SM. Stratified.
27.5' - 28.2'	Brown, mod. comp., silty (20-30) sand, SM, w/weathered rock fragments.
28.2' - 30.0'	No sample (boulder)
30.0' - 33.6'	Br., mod. compact, silty (5-10) sandy (30-40) gravel, GP-GM, w/ weathered rock fragments.
33.6'	Top of Bed Rock.

FD-2 Elev. 383.1

0.0' - 1.4'	Br., loose, sandy (fine 30-40) silt, ML, w/grass roots. Top-soil.
1.4' - 5.0'	Br., loose, silty (30-40) sand, SM, w/roots.
5.0' - 6.5'	Br., loose, silty 19 fine sand, SM. D_{10} = 0.045
6.5' - 10.0'	Br., mod. compact, silty 7 gravelly 26 sand, SP-SM. D_{10} = 0.12
10.0' - 11.7'	Br., mod. compact, silty 12 sand, SP-SM. D_{10} = 0.075
11.7' - 15.0'	Br., mod. compact, silty (5-10) gravelly (10-20) sand, SP-SM.
15.0' - 20.0'	Br., mod. compact, gravelly (25-35) sand, SP.
20.0' - 28.0'	Br., mod. compact, silty, 9 gravelly 16 (20-30) sand, SP-SM.
28.0' - 30.0'	Gray-br., mod. compact, silty (5-15) sand, SP-SM, w/occasional gravel.
30.0' - 40.0'	Gray-br., mod. compact, silty 7 gravelly 16 sand, SP-SM. D_{10} = 0.10
40.0' - 50.0'	Gray-brown, mod. compact, silty (5-15) gravelly (10-20) sand, SM.
50.0'	Bottom of Exploration

FD-3 Elev. 361.5

0.0' - 0.7'	Brown, loose, silty (5-10) sand, SP-SM, w/vegetation.
0.7' - 6.3'	Brown, mod. compact, silty 9 gravelly 16 sand, SW-SM. D_{10} = .09

FD-3	Continued	
	6.3' - 30.0'	Br., mod. compact, silty 7 gravelly 44, 38 sand, SP-SM, D_{10} = .12
	30.0'	Bottom of Exploration
FD-4	Elev. 356.2	
	0.0' - 1.2'	Black-dk. gray, brown, silty (10-20) gravelly (20-30) sand, SM, w/considerable organics.
	1.2' - 4.4'	Br., mod. comp., silty (5-15) sandy (25-35) gravel, GM, w/soft spongy organics.
	4.4' - 8.7'	Light brown, mod. compact, silty (30-40) sand, SM, w/highly weathered cobbles & boulders.
	8.7'	Top of Bed Rock
FD-5	Elev. 372.7	
	0.0' - 1.0'	Topsoil
	1.0' - 2.7'	Br., loose, silty (5-15) m-f sand, SM, w/trace of organics.
	2.7' - 7.0'	Br., mod. comp., silty 5 gravelly 23 sand, SP-SM. D_{10} = 0.18
	7.0' - 9.3'	Br., mod. compact, silty 12 m-f sand, SP-SM. D_{10} = 0.07
	9.3' - 10.0'	Lt. brown, mod. comp., gravelly (20-30) sand, SP.
	10.0' - 15.0'	Br., mod. compact, silty 11 gravelly 13 sand, SP-SM. D_{10} = 0.07
	15.0' - 20.0'	Br., mod. comp., silty 13 m-f sand, SM. D_{10} = .065

FD-5	Continued	
	20.0' - 24.5'	Gray, mod. compact, silty 8 sand, SP-SM. D_{10} = 0.10
	24.5' - 25.0'	Br., mod. compact, silty (40-50) f. sand, SM.
	25.0' - 40.0'	Gray, mod. compact, silty 9 gravelly 17 sand, SP-SM, w/decomposed pieces of gravel. D_{10} = 0.08
	40.0'	Bottom of Exploration
FD-6	Elev. 358.6	
	0.0' - 1.0'	Topsoil
	1.0' - 2.5'	Brown, loose, gravelly (15-25) silty (20-30) sand, SM, w/minor organics and roots.
	2.5' - 5.0'	Brown, loose, sandy (f. 20-30) silt, ML, w/organics and roots.
	5.0' - 5.7'	Dk. brown, mod. comp., sandy (f. 15-25) organic silt, OL, w/roots.
	5.7' - 7.3'	Dk. brown, mod. comp., silty (20-30) sandy (20-30) gravel, GM, w/minor organics & roots.
	7.3' - 12.5'	Gray, mod. comp., silty 9 gravelly 31 sand, SP-SM, D_{10} = 0.10
	12.5' - 20.0'	Brown, loose, mod. comp., silty 9 gravelly 27 sand, SP-SM. D_{10} = 0.10
	20.0' - 25.0'	Brown, mod. comp., silty (5-15) m-f sand, SP-SM.
	25.0' - 28.0'	Brown, mod. comp., silty (5-15) sandy (35-45) gravel, GP-GM, w/cobbles.
	28.0' - 30.0'	Brown, mod. comp., gravelly (10-20) silty (20-30) sand, SM, w/$\frac{1}{2}$" layers of sandy (fine) silt, ML.
	30.0'	Bottom of Exploration

FD-7 Elev. 361.1

0.0' - 0.8'	Topsoil
0.8' - 2.2'	Fill. Br., loose, silty (5-15) sand, SM, w/25% cinders, glass fragments, roots, shoe leather.
2.2' - 4.5'	Fill. Br., loose, silty (5-15) gravelly (15-25) sand, SP-SM, w/minor cinders, ashes and coal and glass fragments.
4.5' - 5.0'	Bl., loose, sandy (fine 15-25) silt, ML, w/organics and w/very thin layers of br. silty f. sand.
5.0' - 10.0'	Br., mod. comp., silty 7 sandy 42 gravel, GP-GM. D_{10} = 0.15
10.0' - 15.0'	Gray, mod. comp., silty 10 sand, SP-SM, w/occ. gravel. D_{10} = 0.07
15.0' - 16.5'	Br., loose, silty (5-15) gravelly (20-30) sand, SP-SM.
16.5' - 25.0'	Gray, mod. compact, clayey silt, CL-ML, laminated and w/trace of f. sand.
25.0'	Bottom of Exploration

FD-8 Elev. 366.6

0.0' - 0.8'	Topsoil w/minor coal, cinders & ashes.
0.8' - 4.5'	Fill. Loose cinders and ashes.
4.5' - 5.0'	Fill. Br., loose, silty (20-30) f. sand, SM, w/minor cinders.
5.0' - 10.0'	Fill. Dk. brown and gray, loose, silty 47 m-f sand, SM, w/organics and minor cinders and coal and occasional natural gravel.

FD-8 Continued

10.0' - 15.0'	Br., mod. compact, silty 7 gravelly 11 sand, SP-SM. D_{10} = 0.13
15.0' - 25.0'	Gray, mod. comp., sandy (f. 33) silt, ML, stratified. D_{10} = 0.03
25.0'	Bottom of Exploration

FD-9 Elev. 364.1

0.0' - 0.7'	Fill. Br., mod. compact, silty (5-15) gravelly (20-30) sand, SP-SM.
0.7' - 3.5'	Fill. Br., mod. compact, gravelly (10-20) silty (25-35) sand, SM, w/minor sticks and straw.
3.5' - 5.0'	Fill. Dk. brown, loose, silty (40-50) f. sand, SM, w/organics and minor brick and coal fragments.
5.0' - 8.5'	Dk. brown and gray, loose, sandy (f. 20-30) silt, ML, w/organics and hair roots.
8.5' - 10.0'	Br., mod. compact, silty 8 m-f sand, SP-SM. D_{10} = 0.10.
10.0' - 12.5'	Br., loose, silty 5 sandy 45 gravel, GP-GM. D_{10} = 0.20.
12.5' - 15.0'	Br., loose, silty 6 gravelly 24 sand, SP-SM. D_{10} = 0.14
15.0' - 20.0'	Brown changing to gray, m-f sand, SP. D_{10} = 0.17.
20.0' - 25.0'	Gray, loose, silty (5-15) m-f sand, SP-SM.
25.0' - 28.5'	Gray, mod. compact, silty (5-15) m-f sand, SP-SM, w/weathered rock fragments, cobbles.
28.5' - 31.8'	White, compact, weathered and decomposed rock fragments.
31.8'	Top of Bed Rock

FD-10 Elev. 362.1

0.0' - 5.0'	Fill. Dk. brown, loose, silty (30-40) f. sand, SM, w/trace of organics.
5.0' - 6.0'	Dk. gray-black, sandy (f. 15-25) organic silt, OL, w/wood chips, twigs and hair roots.
6.0' - 10.5'	Br., mod. compact, gravelly 46 sand, SP, w/minor rotted wood chips. D_{10} = 0.18.
10.5' - 15.0'	Gray, loose, silty 7, m-f sand, SP-SM, w/occ. gravel. D_{10} = 0.13.
15.0' - 18.0'	Gray, loose, m-f sand, SP.
18.0' - 23.0'	Gray, mod. compact, m-f sand, SP, w/cobbles.
23.0' - 27.3'	Gray, mod. comp., gravelly (10-20) sand, SP, w/cobbles.
27.3' - 28.3'	Gray, mod. compact, gravelly (20-30) sand, SP, w/cobbles.
28.3'	Top of Bed Rock

FD-11 Elev. 358.2

0.0' - 0.5'	Topsoil w/broken glass.
0.5' - 4.0'	Fill. Br., loose, silty 10 gravelly 35 sand, SP-SM, w/minor roots and glass fragments. D_{10} = 0.074.
4.0' - 6.0'	Dk. brown, loose, silty 27 sand, SM, w/organics, twigs, and roots. D_{10} = 0.02.
6.0' - 10.0'	Brown, loose, silty 7 sandy 46 gravel, GP-GM. D_{10} = 0.15.
10.0' - 15.0'	Brown, loose, silty 12 sand, SM, w/ minor lumps of organic silt. D_{10} = 0.07.
15.0' - 20.0'	Brown, loose, m-f sand, SP.

FD-11	Continued	
	20.0' - 25.0'	Brown, loose, silty (5-15) f. sand, SM.
	25.0'	Bottom of Exploration
FD-12	Elev. 357.5	
	0.0' - 0.8'	Topsoil
	0.8' - 2.5'	Br., loose, silty 8 sandy 40 gravel, GP-GM, w/hair roots and cobbles. D_{10} = 0.10.
	2.5' - 4.5'	Gray, loose, silty 12 m-f sand, SW-SM, w/occ. gravel. D_{10} = 0.06.
	4.5' - 5.0'	Br., loose, silty (15-25) sand, SM.
	5.0' - 8.5'	Br., mod. comp., sandy 42 gravel, GP. D_{10} = 0.20.
	8.5' - 25.0'	Gray, mod. compact, silty 33 f. sand, SM. Stratified in few zones. D_{10} = 0.045.
	25.0'	Bottom of Exploration
FD-13	Elev. 350.8	
	0.0' - 0.5'	Topsoil
	0.5' - 4.0'	Dk. brown, mod. comp., gravelly (10-20) silty (25-35) sand, SM, w/organic odor and minor roots and organics.
	4.0' - 5.0'	Gray, mod. comp., silty (10-15) gravelly (15-25) sand, SM.
	5.0' - 9.5'	Br., mod. comp., sandy 40 gravel, GP. D_{10} = 0.32.
	9.5' - 20.0'	Gray, mod. comp., sandy 44,45 silt, ML, w/occ. gravel. D_{10} = 0.025.
	20.0'	Bottom of Exploration

FD-14 Elev. 361.2

0.0' - 1.2'	Topsoil
1.2' - 3.5'	Black-gray, soft, organic silt, OH, w/hair roots.
3.5' - 5.0'	Black and brown, loose, silty (20-30) sandy (25-35) gravel, GM. Silt is mainly organic.
5.0' - 6.0'	Brown, mod. comp., silty 13 m-f sand, SM. D_{10} = 0.06.
6.0' - 7.5'	Brown, loose, silty (5-15) sandy (30-40) gravel, GP-GM.
7.5' - 11.5'	Brown, mod. comp., silty 10 sand, SP-SM, w/occ. gravel. D_{10} = 0.09.
11.5' - 14.5'	Brown, loose, silty 38 sand, SM, w/occ. gravel and w/brown lenses of clay (CL). D_{10} = 0.0035.
14.5' - 20.0'	Brown, mod. comp., clayey silt, CL-ML. Slight variation in gradation indicates thin stratification.
20.0'	Bottom of Exploration

FD-15 Elev. 364.3

0.0' - 1.0'	Topsoil
1.0' - 5.0'	Fill. Dk. brown, loose, lightweight, mixture of silt, f-m sand, ashes, cinders, pockets of organic silt, fragments of brick, glass & wire. Probably 60% ashes, cinders, etc.
5.0' - 6.5'	Dk. brown, loose, sandy (25-35) organic silt, OL.
6.5' - 10.0'	Br., mod. comp., silty 6 sandy 46 gravel, GP-GM, D_{10} = 0.18.
10.0' - 11.5'	Br., loose, silty 8 sand, SP-SM, w/occ. gravel. D_{10} = 0.11.

FD-15	Continued	
	11.5' - 18.0'	Brown, mod. compact, silty 9 gravelly 33 sand, SP-SM. D_{10} = 0.30.
	18.0' - 24.5'	Br., mod. comp., silty 10 gravelly 12 sand, SP-SM. D_{10} = 0.074.
	24.5' - 25.0'	Gray, stiff, clayey silt, CL-ML.
	25.0'	Bottom of Exploration
FD-16	Elev. 373.0	
	0.0' - 2.5'	Black, loose topsoil.
	2.5' - 4.5'	Fill. White and gray soft ashes.
	4.5' - 8.5'	Stratified, loose, br., silty (30-40) f. sand, SM, and dark br., sandy (f. 20-30) silt, ML, w/minor organics and hair roots. Possibly fill.
	8.5' - 10.0'	Gray, mod. comp., sandy (35-45) gravel, GP, w/cobbles.
	10.0' - 13.5'	Br., mod. comp., silty 8 sandy 40 gravel, GP-GM, w/cobbles. D_{10} = 0.09.
	13.5' - 30.0'	Gray, mod. compact, silt, ML. Slight variation in gradation indicates stratification. D_{10} = 0.009. LL-NP, PI-NP, W_n = 28.0, 27.1, 31.7.
	30.0' - 45.0'	Gray, mod. comp., clayey silt, ML. Slight variation in gradation indicates stratification. D_{10} = 0.004. LL = 30, PI = 6, W_n = 31.2, 36.4.
	45.0'	Bottom of Exploration

FD-17 Elev. 372.8

0.0' - 5.0'	Fill. Black, mod. comp., mixture of sand, silt, gravel, cinders and ashes. Of total mixture, (20-30) silt sizes, (10-20) gravel sizes. High % of cinders and ashes.
5.0' - 9.0'	Fill. Light gray to dark brown, loose, variable silty 38 sand, SM, w/minor brick and organics and w/ pockets of silt. D_{10} = 0.013.
9.0' - 13.5'	Brown, mod. comp., silty 9 gravelly 45 sand, SP-SM. D_{10} = 0.09.
13.5' - 20.0'	Gray, comp., silt, ML. Slight variation in gradation indicates stratification. D_{10} = 0.004. LL=NP, PI=NP, W_n = 28.0.
20.0' - 25.0'	Same as above except sandy 7 silt, ML. D_{10} = 0.007. LL=NP, PI=NP, W_n = 29.0.
25.0'	Bottom of Exploration

FD-18 Elev. 376.4

0.0' - 1.5'	Topsoil.
1.5' - 9.5'	Fill. Light br., loose, silty 8 m-f sand, SP-SM. D_{10} = 0.085.
9.5' - 10.0'	Fill. Black, loose, ashes and cinders.
10.0' - 11.0'	Fill. Dk. br., loose, gravelly (10-20) silty (30-40) sand, SM, w/minor cinders and coal dust.
11.0' - 15.0'	Variable, brown to gray, loose, gravelly 16 silty 26 sand, SM, w/minor coal and cinders and w/ slight odor varying from organic to petroliferous. D_{10} = 0.030.

FD-18 Continued

15.0' - 19.0'	Gray, mod. comp., silty 13 gravelly 30 sand, SM, w/petroliferous odor. D_{10} = 0.050.
19.0' - 30.0'	Stratified, gray, compact, silty (40-50) f. sand, SM, and sandy (f. 35-45) silt, ML, w/occ. gravel. Becomes more sandy with depth.
30.0'	Bottom of Exploration

FD-19 Elev. 370.1

0.0' - 2.0'	Dk. br., loose, clayey silt, CL-ML, w/plant roots.
2.0' - 5.0'	Fill. Dark brown, loose, cinders and ashes w/wood, metal, brick fragments.
5.0' - 5.5'	Fill. Dark brown, loose, gravelly (10-20) silty (40-50) sand, SM, w/minor metal and ashes.
5.5' - 6.5'	Fill. Dark brown, mod. comp., sandy (20-30) silt, ML, w/organics and minor metal and other debris.
6.5' - 10.0'	Fill. Br., mod. comp., silty 8 sandy 44 gravel, GP-GM, w/minor pieces of metal. D_{10} = 0.10.
10.0' - 15.0'	Br., mod. comp., silty 13 f. to m. sand, SM, w/occasional gravel particles. D_{10} = 0.06.
15.0' - 17.5'	Br., mod. comp., silty (30-40) f. to m. sand, SM.
17.5' - 20.0'	Gray, comp., sandy f. 10 silt, ML, w/occasional cobbles. Slight variation in gradation indicates stratification. D_{10} = 0.011.

FD-19	Continued	
	20.0' - 25.0'	Gray, comp., gravelly (10-20) silty (20-30) sand, SM.
	25.0'	Bottom of Exploration
FD-20	Elev. 373.0	
	0.0' - 9.0'	Fill. Black, loose, cinders and ashes w/minor coal and brick fragments.
	9.0' - 10.0'	Fill. Dk. br., soft sandy (f. 15-25) organic silt, OL, w/pieces of wood.
	10.0' - 12.5'	Fill. Brown, loose, silty 7 sandy 25 gravel, GP-GM, w/cobbles and wood. Gravel in sample is mainly broken cobbles. D_{10} = 0.18.
	12.5' - 15.0'	Dark brown, mod. comp., silty 8 gravelly 32 sand, SP-SM, w/decayed wood and cobbles. D_{10} = 0.10.
	15.0' - 17.7'	Gray-brown, mod. comp., silty (10-20) gravelly (40-50) sand, SM, w/ cobbles. Gravel in sample may be partly broken cobbles.
	17.7' - 20.0'	Gray, comp., sandy (f. 5) silt, ML. Slight variation in gradation indicates stratification. D_{10} = 0.012, LL=NP, PI=NP.
	20.0' - 22.5'	Gray, loose, silt, ML. D_{10} = 0.009. LL=NP, PI=NP, W_n = 26.7.
	22.5' - 25.0'	Gray, mod. comp., gravelly 17 silty 45 sand, SM.
	25.0' - 36.0'	Gray, mod. comp., silty 17 sandy 41 gravel, GM, w/boulders. D_{10} = 0.03.
	36.0' - 37.0'	Brown, compact, gravelly (10-20) sand, SP.
	37.0'	Top of Bedrock

FD-21 Elev. 371.1

0.0' - 0.8'	Topsoil
0.8' - 9.0'	Fill, cinders and ashes.
9.0' - 10.5'	Dk. br., loose, silty (30-40) f. sand, SM, w/organics.
10.5' - 15.0'	Brown, mod. comp., silty 14 gravelly 39 sand, SM, w/cobbles.
15.0' - 20.0'	Brown, mod. comp., silty 8 gravelly 28 sand, SW-SM, w/cobbles. D_{10} = 0.10.
20.0' - 24.0'	Brown, loose, silty 8, sandy 40 gravel, GP-GM, w/organics, petroliferous odor, and cobbles. D_{10}= 0.12.
24.0' - 25.0'	Gray-brown, soft clay, CL, w/petroleum and sandy seams.
25.0' - 30.0'	Gray-brown, loose, silt, ML, w/ slight petroliferous odor.
30.0'	Bottom of Exploration

FD-22 Elev. 371.8

0.0' - 4.5'	Fill. Black, mod. comp., cinders, ashes, coal and wood.
4.5' - 10.0'	Fill. Dk. br., mod. comp., mixture of f-m sand, silt, cinders, ashes and wood w/occ. gravel. Possibly 40-60% natural soil particles and 20% silt sizes.
10.0' - 12.0'	Brown, mod. comp., silty (15-20) f-m sand, SM, w/oil odor. Micaceous.
12.0' - 12.7'	Variable, comp., brown silty (25-35) f-m sand, SM, and black organic silt, OL, w/fine roots.

FD-22	Continued	
	12.7' - 15.0'	Gray, compact, silty (5-15) gravelly (25-35) sand, SP-SM.
	15.0' - 17.5'	Brown, mod. comp., silty 7 sandy 30 gravel, GP-GM. Micaceous. D_{10} = 0.15.
	17.5' - 21.5'	Brown, mod. comp., silty 17 m-f sand, SM, w/occ. gravel. D_{10} = 0.04.
	21.5' - 24.0'	Brown, mod. comp., silty 12 sandy 35 gravel, GP-GM. Micaceous. D_{10} = 0.06.
	24.0' - 25.0'	Brown, mod. comp., sandy (30-40) silt, ML.
	25.0'	Bottom of Exploration
FD-23	Elev. 364.9	
	0.0' - 1.5'	Dk. br., loose, silty (20-30) sand, SM, w/grass and weed roots and occasional gravel. Topsoil.
	1.5' - 5.0'	Fill. Dk. br., loose, silty (15-25) sand, SM, w/bl. sandy (f. 20-30) organic silt, minor rotted wood chips, and occasional gravel.
	5.0' - 8.5'	Dk. brown, loose, m-f sand, SP, oil stained, w/matted felt, rotted wood and shells.
	8.5' - 10.0'	Dk. br., to black, loose, gravelly (10-20) c-f sand, SP, oil stained and with strong oil odor.
	10.0' - 15.0'	Dk. brown, black, mod. compact, sandy 29 gravel, GW, w/minor lumps of black, sandy (f. 20-30) organic silt, and w/oil odor. D_{10} = 0.20.
	15.0' - 20.0'	Gray, mod. comp., sandy 13 silt, ML.
	20.0'	Bottom of Exploration

FD-24 Elev. 372.7

0.0' - 5.0'	Fill. Dk. brown-black, loose sand, SP, oil soaked, and with occ. gravel and coal.
5.0' - 10.0'	Fill. Dk. brown-black, loose, gravelly (10-20) c-f sand, SP, oil staining, and w/minor cinder and coal fragments.
10.0' - 11.0'	Fill. Dk. brown-black, loose, silty (5-15) gravelly (20-30) sand, SM, w/organic silt lumps, roots and oil staining.
11.0' - 13.3'	Dk. brown, sandy (f. 20-30) organic silt, OL, w/wood fibers.
13.3' - 19.0'	Brown, mod. comp., silty 7 gravelly 43 sand, SP-SM. D_{10} = 0.13.
19.0' - 20.0'	Gray, very compact, sandy (f. 10-20) silt, ML, w/cobbles.
20.0' - 21.1'	Rock fragments w/20% gray, f. sandy silt, ML.
21.1'	Top of Bedrock

FD-25 Elev. 369.6

0.0' - 0.8'	Dk. brown, loose, topsoil.
0.8' - 2.5'	Fill. Br., loose, silty (10-20) gravelly (10-20) sand, SM.
2.5' - 3.5'	Dk. br., loose, sandy (10-20) silt, ML, w/organics.
3.5' - 6.5'	Reddish-brown, loose, gravelly 14 silty 18 sand, SM. D_{10} = 0.035.
6.5' - 18.5'	Brown to gray, mod. comp., silty 14,15 fine sand, SM. D_{10} = 0.06, 0.07.

FD-25	Continued	
	18.5' - 25.0'	Gray, mod. comp., silty 35, 48 f. sand, SM, stratified. D_{10} = 0.03, 0.018.
	25.0' - 35.0'	Gray, mod. compact, silty (20-30) f. sand, SM, and f. sandy (20-30) silt, ML. Stratified.
	35.0'	Bottom of Exploration
FD-26	Elev. 365.1	
	0.0' - 4.0'	Fill. Wool, glass, metal, coal, etc.
	4.0' - 5.0'	Fill. Light brown, loose, gravelly (10-20) sand, SP, w/minor coal, wool, etc.
	5.0' - 6.5'	Dk. brown, loose, silty (40-50) f. sand, SM, w/few roots. Micaceous.
	6.5' - 10.0'	Brown, loose, sandy 40 silt, ML. D_{10} = 0.006.
	10.0' - 14.5'	Brown, mod. comp., silty 8 sandy 38 gravel, GP-GM. D_{10} = 0.10.
	14.5' - 29.0'	Light gray-brown, mod. comp., silty 21, 34 f. sand, SM. D_{10} = 0.05, 0.04.
	29.0' - 30.0'	Light gray-brown, mod. comp., silty (10-20) sand, SM, w/occ. gravel. Micaceous.
	30.0'	Bottom of Exploration
FD-27	Elev. 369.7	
	0.0' - 2.5'	Fill. Brown, loose, gravelly (10-20) sand, SP, w/minor cinders, coal and brick fragments.

FD-27 Continued

2.5' - 10.0'	Fill. Dk. brown, mod. comp., mixture of sand, gravel, silt, cinders, ashes, coal and brick. Silt sizes (20-30). Probably more than 50% is cinders and ashes.
10.0' - 11.5'	Brown, mod. comp., silty (40-50) f. sand, SM, w/occ. gravel.
11.5' - 15.9'	Brown to gray, mod. comp., silty 18 sandy 35 gravel, GM, w/boulders between depths 12.9 and 15.0 and w/probably cobbles. D_{10} = 0.02.
15.9'	Top of Bedrock

FD-28 Elev. 370.3

0.0' - 0.9'	Fill. Lt. brown, loose, sandy (30-40) gravel, GP, w/minor glass and cinders.
0.9' - 5.0'	Fill. Black, loose, cinders and ashes w/occ. gravel and organic silt balls.
5.0' - 8.8'	Brown, loose, silty 9, gravelly 36, sand, SP-SM, w/trace of oil odor. May be fill. D_{10} = 0.08.
8.8' - 10.0'	Variable loose, brown, sandy (f. 10-20) silt, ML, and black organic silt, OL.
10.0' - 21.9'	Fill. Brown, comp., silty 12, 10 gravelly 33, 35 sand, SP-SM, w/ minor coal and cinders. D_{10} = 0.06, 0.07.
21.9' - 35.0'	Gray, loose, uniform silt, ML. D_{10} = 0.013.
35.0'	Bottom of Exploration

FD-29 Elev. 368.9

0.0' - 3.9'	Crushed stone.
3.9' - 12.3'	Fill. Brown, very loose to compact, sandy 25 gravel, GP, w/ minor coal and cinder fragments. D_{10} = 0.10.
12.3' - 15.0'	Fill. Brown, mod. comp., silty 16 gravelly 35 sand, SM, w/trace of oil stain.
15.0' - 20.0'	Fill. Brown, mod. comp., silty (5-15) sandy (30-40) gravel, GP-GM, w/10 to 20% coal, cinders, etc., and with trace of oil.
20.0' - 22.1'	Gray, loose, gravelly (10-20) sandy (20-30) silt, ML, w/oil stains. May be fill.
22.1' - 30.0'	Brown, comp., silty 14 sandy 33 gravel, GM. Some gravel easily crushed. D_{10} = 0.05.
30.0'	Bottom of Exploration

FD-30 Elev. 361.7

0.0' - 5.0'	Fill. Black, loose, silty (5-15) sandy (30-40) gravel, GP-GM, w/10-20% coal, brick, cinders, glass.
5.0' - 10.0'	Fill. Brown, mod. comp., sandy (40-50) gravel, GP, w/minor coal and cinders.
10.0' - 14.5'	Fill. Light brown and black, loose, silty, 7 gravelly 40 sand, SP-SM, w/10-20% coal, cinders, etc. D_{10}=0.11.
14.5' - 15.0'	Gray, loose, sandy (f. 10-15) silt, ML.
15.0' - 30.0'	Gray, loose, sandy 16 silt, ML. Micaceous. D_{10} = 0.015, W_n = 22.2.
30.0'	Bottom of Exploration

FD-31	Elev. 371.1	
	0.0' - 7.8'	Fill. Dk. brown, very loose lightweight mixture, f-m sand, silt, ashes, cinders, coal.
	7.8' - 12.4'	Black, loose, sandy (f. 20-30) organic silt, OL, w/hair roots.
	12.4' - 25.0'	Gray-brown, mod. comp., silty 5, 8 sandy 27, 46 gravel, GP-GM, w/dark gray pockets between 20.0' and 25.0'. D_{10} = 0.02, 0.01.
	25.0' - 30.0'	Brown, mod. comp., silty (40-50) f-m sand, SM, w/occ. gravel.
	30.0' - 31.9'	Brown, mod. comp., gravelly (10-20) silty (25-35) sand, SM.
	31.9' - 35.0'	Brown, comp., silty (25-35) gravelly (25-35) sand, SM.
	35.0'	Bottom of Exploration
FD-32	Elev. 372.2	
	0.0' - 7.0'	Fill. Black, mod. comp., cinders and ashes, w/boulders between 4.2' and 7.0'.
	7.0' - 10.0'	Fill. Dk. brown, mod. comp., silty (10-20) gravelly (10-20) sand, SM, w/minor cinders, coal dust and fine roots.
	10.0' - 14.0'	Dk. brown, mod. comp., gravelly (10-20) silty (20-30) sand, SM, w/minor organics and boulders from 12.3' to 14.0'.
	14.0' - 17.4'	Brown, mod. comp., silty 7, sandy 46 gravel, GP-GM. D_{10} = 0.01.
	17.4' - 20.0'	Gray, comp., silt, ML. D_{10} = 0.005.

FD-32 Continued

20.0' - 25.0'	Gray, comp., sandy f. 30 silt, ML. D_{10} = 0.015.
25.0' - 30.0'	Gray, comp., silt, ML.
30.0'	Bottom of Exploration

FD-33 Elev. 371.9

0.0' - 2.1'	Fill. Black, comp., cinders and ashes.
2.1' - 9.5'	Fill. Tan, loose, silty 8, m-f sand, SP-SM. D_{10} = 0.08.
9.5' - 10.9'	Brown, loose, gravelly (10-20) silty (20-30) sand, SM.
10.9' - 13.1'	Brown and black silt, ML, and organic silt, OL, w/fine roots. May be fill.
13.1' - 15.0'	Brown, loose, silty (5-15) m-f sand, SP-SM.
15.0' - 20.0'	Brown, mod. comp., silty 8 gravelly 41 sand, SP-SM. D_{10} = 0.12.
20.0' - 25.0'	Brown, mod. comp., silty 12 gravelly 44 sand, SP-SM. D_{10} = 0.05.
25.0' - 26.1'	Brown, mod. comp., silty (20-30) sandy (20-30) gravel, GM.
26.1' - 27.9'	Gray, mod. comp., silt, ML.
27.9' - 30.0'	Gray, comp., silty (40-50) f. sand, SM, w/½" layers of clayey silt, CL-ML.
30.0'	Bottom of Exploration

FD-34 Elev. 367.8

0.0' - 8.2'	Fill. Dk. brown, loose, mixture of approx. 50% silty (5-15) sand, SP-SM, and 50% coal, cinders, ashes, and bricks.
8.2' - 10.0'	Fill. Black, loose, gravelly (20-30) organic silty (30-40) sand, SM, w/approx. 50% felt scraps.
10.0' - 15.0'	Brown, mod. compact, silty (5-15) sandy (30-40) gravel, GP-GM.
15.0' - 18.7'	Gray-brown, mod. compact, f. sandy 12 silt, ML. D_{10} = 0.013.
18.7' - 20.0'	Gray-brown, mod. comp., sandy (f. 10-20) silty (20-30) gravel, GM. Gravel sizes are white and weathered.
20.0' - 25.0'	Brown, mod. comp., silty 12 sandy 32 gravel, GP-GM, w/oil odor. D_{10}= 0.05.
25.0'	Bottom of Exploration

FD-35 Elev. 360.5

0.0' - 4.7'	Fill. Brown, loose, silty (5-15) m-f sand, SP-SM, w/10% rotted wood, peat, coal and grass roots.
4.7' - 7.1'	Fill. Wood chips and coal, oil stained, w/30-50% brown-black, loose, silty (30-40) sand, SM.
7.1' - 20.0'	Brown-gray, loose, silty 7 gravelly 22 sand, SP-SM. D_{10} = 0.13.
20.0'	Bottom of Exploration

FD-36 Elev. 393.4

0.0' - 1.1'	Topsoil.
1.1' - 10.0'	Brown, loose, c-f sand, SP, w/occ. gravel and occasional small tree roots. D_{10} = 0.18.
10.0' - 20.0'	Brown, loose, silty 10 gravelly 18 sand, SP-SM. D_{10} = 0.08.
20.0' - 25.0'	Brown, loose, silty 13 gravelly 15 c-f sand, SM, w/occasional small tree roots. D_{10} = 0.05.
25.0' - 30.0'	Gray-brown, mod. comp., silty 10 sandy 41 gravel, GP-GM. D_{10} = 0.06.
30.0' - 35.0'	Gray-brown, mod. comp., c-f sand, SP.
35.0' - 46.1'	Brown, loose, silty 10 m-f sand, SP-SM, D_{10} = 0.08.
46.1' - 50.0'	Brown and white, compact silty (10-20) gravelly (20-30) sand, SM, w/easily crushed, weathered and decomposed gravel sizes.
50.0'	Bottom of Exploration

FD-37 Elev. 391.4

0.0' - 1.1'	Topsoil.
1.1' - 14.1'	Brown to gray, loose, silty 8, 7 gravelly 13, 27 sand, SP-SM, D_{10}= 0.11.
14.1' - 28.6'	Gray to br., loose to mod. comp., silty 18, 15 m-f sand, SM. D_{10}= 0.04.
28.6' - 50.0'	Gray, mod. comp., silty 29, 22, 20 m-f sand, SM. D_{10} = 0.025, 0.04, 0.043.
50.0'	Bottom of Exploration

FD-38 Elev. 368.0

0.0' - 1.9'	Topsoil.
1.9' - 5.0'	Reddish-brown, loose, silty (10-20) fine sand, SM.
5.0' - 10.0'	Brown, loose, silty 22 m-f sand, SM. D_{10} = 0.04.
10.0' - 14.2'	Brown, loose, silty 12 m-f sand, SP-SM. D_{10} = 0.07.
14.2' - 25.0'	Gray-brown, mod. comp., silty 42, m-f sand, SM. D_{10} = 0.01.
25.0' - 35.0'	Gray, mod. comp., silty 20 c-f sand, SM, W/occ. gravel. D_{10} = 0.02.
35.0'	Bottom of Exploration

FD-39 Elev. 361.6

0.0' - 1.9'	Brown, loose, sandy (40-50) gravel, GP.
1.9' - 15.0'	Lt. brown, loose, silty 7, c-f sand, SP-SM, w/occ. gravel. D_{10}= 0.10, 0.09.
15.0' - 20.0'	Gray-brown, loose, silty 13 f. sand, SM. D_{10} = 0.06.
20.0'	Bottom of Exploration

FD-40 Elev. 361.9

0.0' - 0.4'	Topsoil.
0.4' - 3.9'	Brown, loose, gravelly (5-15) sand, SP.
3.9' - 8.2'	Lt. brown, loose, m-f sand, SP. D_{10} = 0.15.

FD-40	Continued	
	8.2' - 15.0'	Gray-brown, loose, silty 17 fine sand, SM. D_{10} = 0.05.
	15.0' - 20.0'	Gray-brown, loose, silty (20-30) (30-40) f. sand, SM.
	20.0'	Bottom of Exploration
FD-41	Elev. 361.0	
	0.0' - 0.1'	Asphalt pavement.
	0.1' - 6.2'	Fill. Brown, loose, silty 8 gravelly 23 sand, SP-SM. D_{10} = 0.12.
	6.2' - 8.0'	Dk., brown, loose, organic f. sandy (10-20) silt, OL.
	8.0' - 8.9'	Gray-brown, loose, silty (10-20) m-f sand, SM.
	8.9' - 15.9'	Br., mod. comp., sandy 43 gravel, GP. D_{10} = 0.25.
	15.9' - 20.0'	Lt. brown, mod. comp., m-f sand, SP, w/occ. gravel.
	20.0'	Bottom of Exploration
FD-42	Elev. 360.5	
	0.0' - 1.2'	Topsoil.
	1.2' - 12.4'	Br., loose, silty 11 gravelly 12, (5-20) sand, SP-SM. D_{10} = 0.07.
	12.4' - 20.0'	Gray-brown, mod. comp., silty (5-15) sandy (30-40) gravel, GP-GM.
	20.0'	Bottom of Exploration

FD-43 Elev. 358.3

0.0' - 8.1'	Fill. Black and brown, loose, sandy (30-40) gravel, GP, w/ minor roofing felt, cinders, brick fragments, glass, scrap iron, and shoe leather. Upper part of stratum black organic stained.
8.1' - 11.2'	Gray-brown, loose, silty (5-15) m-f sand, SP-SM, w/organic silt lumps.
11.2' - 20.0'	Gray, loose, f. sandy 32 silt, ML. D_{10} = 0.02.
20.0'	Bottom of Exploration

FD-44 Elev. 364.5

0.0' - 0.2'	Asphalt pavement.
0.2' - 1.5'	Fill. Brown, loose, sand, SP, w/occ. gravel.
1.5' - 4.5'	Fill. Brick & concrete frags., cinders, ashes, wood, glass, organic silt lumps, w/20-30% silty (10-20) f. sand.
4.5' - 7.5'	Brown, loose, silty (20-30) m-f sand, SM, w/minor organic silt lumps.
7.5' - 9.6'	Dk., brown, organic silt, OL.
9.6' - 15.9'	Brown, mod. comp., silty (5-15) sandy (35-45) gravel, GP-GM.
15.9' - 20.0'	Gray, loose, silty (5-15) gravelly (10-20) c-f sand, SP-SM.
20.0'	Bottom of Exploration

FD-45 Elev. 365.9

0.0' - 0.2'	Asphalt pavement.
0.2' - 2.0'	Fill. Brown, mod. comp., silty (5-15) gravelly (10-20) sand, SP-SM.
2.0' - 8.8'	Fill. Black, loose, cinders and ashes.
8.8' - 13.7'	Gray, mod. comp., silty (5-12) sandy (35-45) gravel, GP-GM.
13.7' - 20.0'	Gray, mod. comp., silty (40-50) f. sand, SM.
20.0'	Bottom of Exploration

FD-46 Elev. 364.7

0.0' - 1.1'	Topsoil.
1.1' - 4.1'	Fill. Brown, loose, silty (20-30) sand, SM, w/40-50% brick, glass and cinders.
4.1' - 5.9'	Fill. Dk. brown, loose, silty (30-40) sand, SM, w/occ. gravel.
5.9' - 6.9'	Dk. brown & gray, loose, organic silty (40-50) m-f sand, SM, w/ twigs.
6.9' - 13.9'	Brown, mod. comp., sandy (30-40) gravel, GP.
13.9' - 15.0'	Brown, mod. comp., silty (30-40) f. sand, SM.
15.0'	Bottom of Exploration

FD-47 Elev. 366.7

0.0' - 0.8'	Topsoil.

FD-47 Continued

0.8' - 7.3'	Fill. Dk. brown, loose, cinders, ashes and coal fragments w/ approx. 50% silty (5-12) sand, SP-SM.
7.3' - 15.0'	Brown, loose, silty (10-20) sandy (30-40) gravel, GM, w/minor wood chips, 7.3' to 10.0'.
15.0'	Bottom of Exploration

FD-48 Elev. 357.4

0.0' - 1.9'	Fill. Brown, loose, sandy (30-40) gravel, GP, w/10-20% coal, cinders, nails and glass.
1.9' - 5.0'	Fill. Brown, loose, silty 7 sandy 42 gravel, GP-GM. D_{10} = 0.15.
5.0' - 20.0'	Gray, loose, silty 7 gravelly 10 c-f sand, SP-SM. D_{10} = 0.14.
20.0'	Bottom of Exploration

FD-49 Elev. 363.3

0.0' - 3.5'	Fill. Brown, loose, silty (10-20) gravelly (10-20) sand, SM, w/30-50% coal, brick, wood, glass, cinders and felt.
3.5' - 7.8'	Dk. brown, loose, organic f. sandy (40-50) silt, OL, w/small roots.
7.8' - 13.9'	Brown, loose, silty 9 gravelly 33 sand, SP-SM. D_{10} = 0.08.
13.9' - 17.9'	Gray, mod. stiff, sandy 23 silty clay, CL-ML. D_{10} = 0.004. LL = 29, PI = 7.
17.9' - 20.0'	Brown, mod. compact, silty (10-20) sandy (25-35) gravel, GM.

FD-49	Continued	
	20.0' - 26.4'	Brown, mod. comp., silty (5-15) sandy (30-40) gravel, GP-GM, w/cobbles.
	26.4' - 30.0'	Br.-gray, mod. comp., silty (20-30) f. sand, SM.
	30.0'	Bottom of Exploration
FD-50	Elev. 362.5	
	0.0' - 2.4'	Fill. Dk. brown, loose, silty (5-15) sand, SP-SM, w/30-40% cinders, concrete, coal, wood and glass.
	2.4' - 6.8'	Fill. Dk. brown, loose, silty (25-35) sand, SM, w/minor cinders, occ. gravel and organics.
	6.8' - 8.2'	Brown, mod. comp., silty (5-15) sandy (30-40) gravel, GP-GM.
	8.2' - 20.0'	Gray-brown, loose, silty (10-20) m-f sand, SM.
	20.0'	Bottom of Exploration
FD-51	Elev. 374.6	
	0.0' - 0.2'	Crushed stone.
	0.2' - 5.9'	Fill. Brown, loose, sand, SP, w/10-20% gravel sized cinders.
	5.9' - 8.9'	Fill. Lt. brown, loose, m-f sand, SP, w/occ. gravel.
	8.9' - 13.9'	Gray-brown, loose, silty (30-40) f. sand, SM, w/organics.
	13.9' - 20.0'	Brown, mod. comp., silty (5-12) sandy (30-40) gravel, GP-GM.
	20.0'	Bottom of Exploration

FD-52 Elev. 361.6

0.0' - 0.9'	Fill. Brown, loose, silty (5-12) sandy (30-40) gravel, GP-GM, w/ 20-30% coal, wood, brick, cinders and glass.
0.9' - 6.1'	Dk. gray-brown, mod. comp., silty (5-12) sandy (30-40) gravel, GP-GM, w/oil odor.
6.1' - 10.0'	Brown, mod. comp., silty (5-12) sandy (35-45) gravel, GP-GM.
10.0' - 14.1'	Brown, mod. comp., silty 7, gravelly 42, sand, SP-SM. D_{10} = 0.110.
14.1' - 20.0'	Brown, mod. comp., gravelly (10-20) silty (35-45) sand, SM.
20.0'	Bottom of Exploration

FD-53 Elev. 371.9

0.0' - 0.9'	Topsoil.
0.9' - 8.4'	Fill. Dk. brown, loose, silty (15-25) sand, SM, w/10-20% gravel size concrete, coal and cinders.
8.4' - 12.1'	Brown, mod. comp., silty (5-15) sandy (35-45) gravel, GP-GM.
12.1' - 18.1'	Gray-brown, mod. comp., silt, ML. D_{10} = 0.0065.
18.1' - 25.0'	Gray-br., mod. comp., silty (10-20) sandy (30-40) gravel, GM.
25.0'	Bottom of Exploration

FD-54 Elev. 372.1

0.0' - 5.0'	Fill. Dk. brown, loose, silty (15-25) c-f sand, SM, w/occ. gravel and 10-30% brick, coal, cinders and glass.

FD-54	Continued	
	5.0' - 10.9'	Fill. Dk. brown, mod. compact, silty (5-15) c-f sand, SP-SM, w/occ. gravel and 10% brick, glass, cinders and metal.
	10.9' - 20.0'	Gray-brown, mod. comp., silt, ML. D_{10} = 0.008.
	20.0'	Bottom of Exploration
FD-55	Elev. 364.0	
	0.0' - 7.1'	Gray-brown to brown, loose, silty (5-15) gravelly (5-20) c-f sand, SP-SM, w/minor wood & brick fragments 0' to 5'.
	7.1' - 12.2'	Brown, loose, silty 16, gravelly 21, sand, SM. D_{10} = 0.040.
	12.2' - 25.0'	Gray-brown, mod. comp., silt, ML. D_{10} = 0.009.
	25.0'	Bottom of Exploration
FD-56	Elev. 355.4	
	0.0' - 1.4'	Topsoil.
	1.4' - 3.9'	Brown, loose, silty (20-30) f. sand, SM, w/hair roots. Subsoil.
	3.9' - 9.1'	Brown, loose, sandy 40, gravel, GP. D_{10} = 0.35.
	9.1' - 20.0'	Gray-brown, mod. comp., silty (25-35) f. sand, SM.
	20.0'	Bottom of Exploration
FD-57	Elev. 355.6	
	0.0' - 1.1'	Topsoil.

FD-57 Continued

1.1' - 4.1'	Dark brown, loose, silty (40-50) f. sand, SM, w/hair roots. Subsoil.
4.1' - 8.1'	Brown, mod. comp., sandy 39, gravel, GP. D_{10} = 0.25.
8.1' - 10.0'	Brown, mod. comp., silty (45-50) f. sand, SM.
10.0' - 20.0'	Brown to gray brown, loose, silty (5-15) fine to med. sand, SP-SM.
20.0'	Bottom of Exploration

FD-58 Elev. 347.5

0.0' - 1.1'	Topsoil.
1.1' - 3.3'	Fill. Dk. brown, mod. comp., silty (5-10) sandy (30-40) gravel, GP-GM, w/trace of asphalt and wood.
3.3' - 10.0'	Gray-brown, comp., f. sandy 48, silt, ML. D_{10} = 0.035.
10.0' - 20.0'	Gray-brown, mod. comp., silty (15-25) f. sand, SM.
20.0'	Bottom of Exploration.